The IRON AGE

April 14, 1960 A Chilton Publication The National Metalworking Weekly

Tool Engineers' Show Feature:

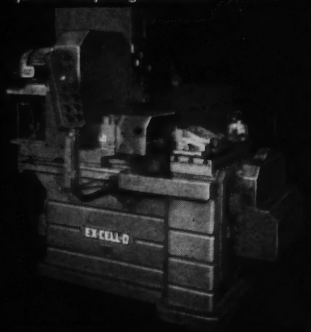
More for Your Numerical Controls Dollar P. 149

Small Companies Find Overseas Markets – P. 119

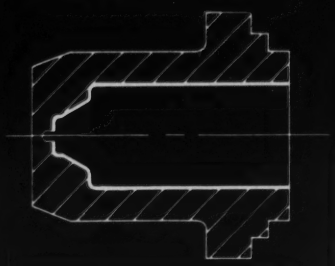
Engineers Tackle Aerospace Problems – P. 124

Digest of the Week – P. 2-3

LEFT—Closeup photo shows the .003" radius boring tools and the size of the parts held in the three-jawed diaphragm chucks.



ABOVE—The Style 308 Cam-Operated Precision Boring Machine used in this high-output machining operation.



ABOVE—Cutaway, twice actual size of the part, shows contour of the finished cut. Surface finish is held to 12 RMS.

59-20

BORES AND CONTOURS 184 PARTS PER HOUR

Style 308 Cam-Operated Precision Boring Machine finishes small stainless steel parts to 12 RMS

Speed and precision in continuous, close-tolerance production of contoured parts come easy to this Ex-Cell-O Cam-Operated Precision Boring Machine. Direct cam action makes it possible. Two cams are mounted on a single shaft; one acts directly on the cross slide follower, the other on the table follower. There are no levers. Changing the cams changes the form for the next job—in minutes.

Style 308 (illustrated) and the larger Style 312 hold the parts in one or more spindles, tools are mounted on the cross slide. The machine above uses such a setup to straight-bore and generate the inside contour of 184 parts per hour, two at a time.

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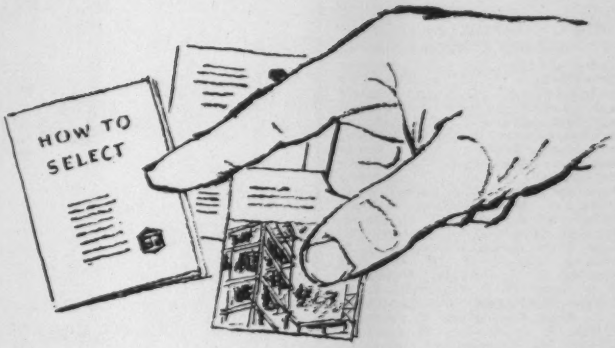

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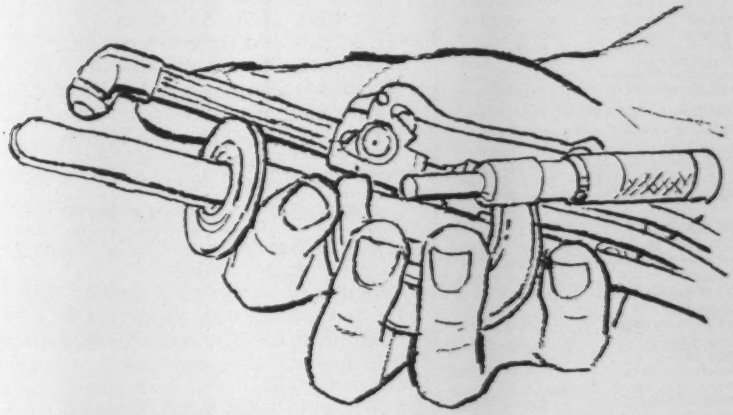

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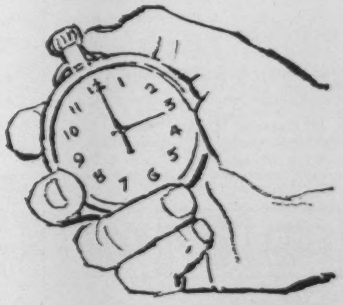

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The IRON AGE

April 14, 1960—Vol. 185, No. 15

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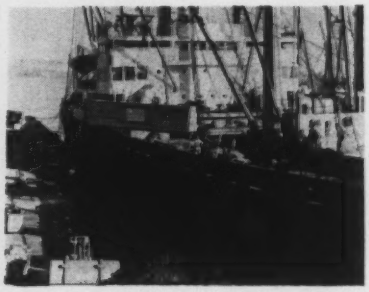
News of the Industry

EXPORT MARKETS

Ready for Development—World markets aren't yet out of reach for U. S. manufacturers. But it takes



initiative and selling to compete abroad. Companies who work at it are actually increasing export markets. P. 119

DEFENSE CONTRACTING

Too Little for Too Many?—Congress may tighten laws to give small firms a better opportunity in defense contract bidding. Now many orders are awarded with use of open bidding. P. 122

BETTER PACKAGING

More Sales Impact—Packaging material makers are going all-out to make their products more attractive and useful. Competition is increasing among different types of wrapping materials. P. 123

SPACE ENGINEERING

Solving the Problems — Aerospace projects demand new mate-

Metalworking

Cover Feature

NUMERICAL CONTROLS—Spend your "Numerical Control Dollar" wisely and you'll reap the benefits of accelerated production. Pratt & Whitney is getting just that from this programmed setup using a Bendix control. P. 149

rials that can't always be handled by conventional techniques. This often creates new metalworking problems. But as soon as engineers solve one problem, others take its place. P. 124

WASHINGTON

Space Costs Soar — Learning about space is to cost at least $15 billion over the next 10 years. P. 139

Engineering-Production Developments

HOW TO GET MORE FROM NUMERICAL CONTROLS

Proper Terms—Few ideas have caught the metalworking industry's fancy as has control. It's hailed as the answer to many problems. Yet, a fog of terminology still veils it. Here are the types and the jobs they'll do. P. 149

Can You Use Them?—Chances are that your shop has jobs that are ideal for numerical controls. The way to find out is to check your cost data. Machine tools don't earn money when they're idle. Here are some comparisons and tips to guide you. P. 153

Sell Management—Key to a successful numerical control program is total organization support. Each link in the chain is important: management, engineering, programming, production and maintenance. A strong chain from top to bottom is vital. P. 156

The Tooling Step—Tape replaces much of the usual tooling. But you still need cutting tools and workholding devices. There are differences, though. Watch out for them. The road to success banks on tooling choice. P. 158

Maintenance — Proper maintenance of electronic equipment is one of the bugaboos of the shop. But it needn't be. Planned preventive maintenance can keep numerical machines running and delivering as expected. All it takes is familiarity with the equipment. P. 160

Careful Plans—Success in this new field hinges on getting off on the right foot. You must plan properly and organize effectively to gain full benefits. The major problem simply boils down to one of education. P. 162

Market and Price Trends

WAREHOUSE PRICING

How to Cut Costs—Recent price changes brought out complaints that announced cuts weren't cuts at all. Warehouse men now explain in detail how new policy works. P. 126

AUTOMOTIVE

Fleets up—Lease or rental of autos and trucks is growing. It's taking fleet automotive purchasing volume up with it. P. 133

MACHINE TOOLS

Aluminum Engine Line—Automation equipment originally designed for working cast iron engine parts is being converted to handle aluminum. It's a big job, but it has advantages. P. 141

STEEL SUMMARY

Still Uncertain—The steel market is still in the process of correction. Orders are not good, but cancellations have slowed. P. 221

PURCHASING

Plating Equipment—Makers of plating equipment say sales this year are ahead of 1959. And they expect the rest of the year to be good. P. 222

NEXT WEEK

WELDING ELECTRODES

Choose the Right Ones—The ten most commonly used welding electrodes are featured in next week's issue. The ABC's of proper electrode selection will be spelled out in hopes that industry might learn more about steel welding.

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Koroseal linings installed by New England Lead Burning Company, San Leandro, Calif.

Aluminum soaks in an acid bubble bath

SUBMERGED in that tank are racks of aluminum parts being anodized. The solution is sulphuric acid—so corrosive it eats holes in steel.

For years, the only way of keeping the dangerous acid from leaking out was to line metal tanks with lead sheets. This cost a lot, yet wasn't altogether foolproof. Every so often, a "wild" electric current would punch a hole in the lead lining. The whole department waited while the repair crew plugged the leak.

Then came Koroseal, the flexible material developed by B.F.Goodrich, that can stand practically all acids. When the aluminum fabricating company opened its new plant (shown above), the new sulphuric acid tank was lined with Koroseal. That was a year and a half ago. Since then, no leaks, no repairs, no delays in production.

Today, there are scores of installations in industry where Koroseal tank linings are handling acids and chemicals that ruin other materials—and doing it better and for less money than was ever possible before. If you have a tank lining problem, it's quite likely that we have the Koroseal or rubber lining that'll solve it. Try us. For information, write *B.F.Goodrich Industrial Products Co., Dept. M-819, Akron 18, Ohio.*

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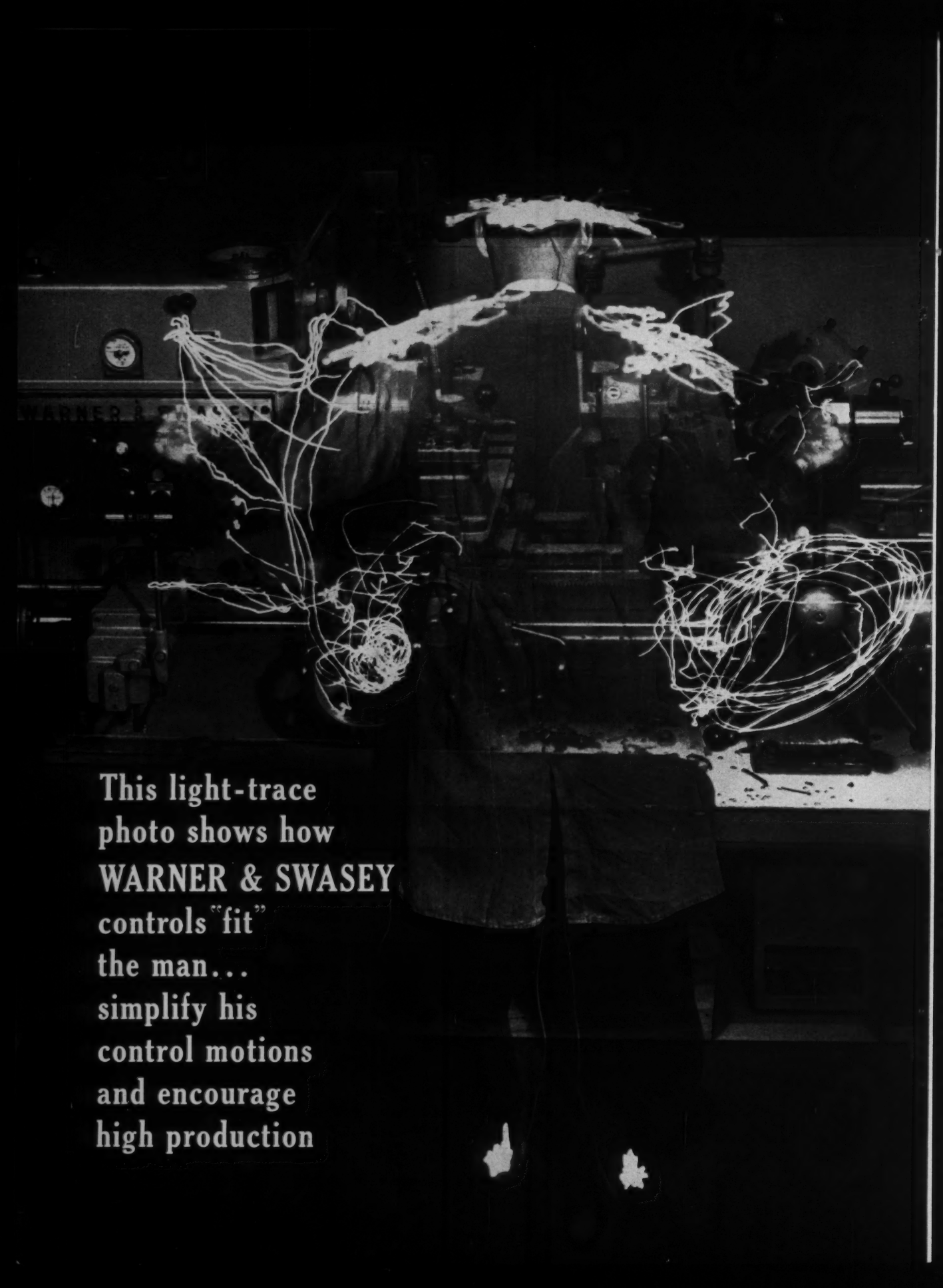
TANK LININGS



This light-trace
photo shows how
WARNER & SWASEY
controls "fit"
the man...
simplify his
control motions
and encourage
high production

Taxpayers' Rebellion: It Is Now in the Making!

A fellow wrote to us the other day that he agreed with things we said. Then he said we never suggested what to do to change them. Maybe he hasn't read all our pieces. We have had plenty to say about what ought to be done —and how to do it. But here goes again.

He was incensed — and rightly so — about taxes and what a lousy deal the government gives its taxpayers with the way the money is wasted. His idea was that the average person (he and his friends) was "fed up."

Well, he has a lot of company. The average citizen, the regular fellows, the irregular ones, the big wheels, the small wheels, and everyone else are fed up too. Maybe, like us, they mumble in their beards and do nothing about it.

As long as most people will vote for a big deal and then vote against the method of paying for it, we are far from getting anywhere. As long as politicians up for re-election see no "burn" in the eyes of their constituents, they will spend away.

As long as city, county and state taxers and spenders have a free rein, with no indignation or complaints, off they go to the races—time and time again. But the recent tax rebellion of Staten Island property owners over some high-handed assessment revisions did give fright to some New York politicos.

The only way any of us can beat this tax thing is to:

Ask for fewer services from government.

Make our views known by writing to the people who do the things we don't like or want.

Make it hot for our congressman and state representatives if they vote as if there was no end to the money that is being spent.

Write to the Defense Dept. and complain about wasteful errors and practices and seepage of millions of dollars down rat holes.

Support those who want saneness, revisions and progress in tax bodies, tax methods, and tax distribution.

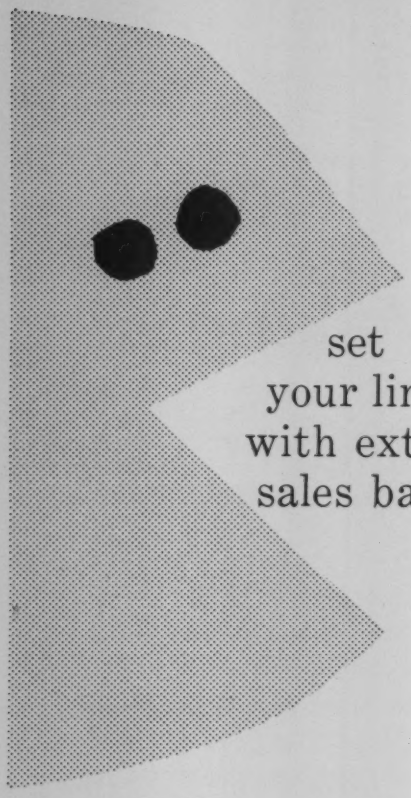
If we want everything under the sun without paying for it, or if we stand by and let taxing bodies take over, then our rebellion will be a fizzle.

When we finally do rebel, we may not make sense. So let's tell everyone who can do something about what we want, why we want it.

Then support those who do something about it!

Tom Campbell

Editor-in-Chief



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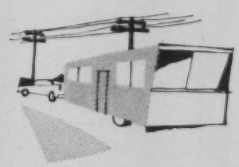

TI-CO protects families, too, in modern house trailers. Thousands of these compact, mobile homes have roofs made of this non-flaking galvanized sheet.

Years of corrosion-resisting service are added to washers, dryers, refrigerators and other appliances whose parts are made of non-flaking TI-CO.

Poultry feeders and other farm equipment subjected to weather and abusive chemicals last longer when made of non-flaking TI-CO.

Castings Form Weapons

Use of investment castings for small weapons eliminates many machining operations and reduces expensive tooling. In some cases, a single casting replaces several components which would normally be required by conventional machining. In addition, the amount of alloy steel required has been cut. Another benefit, according to the U. S. Army, is improved service life of flash suppressors.

Putty Doubles as Adhesive

Ryan Aeronautical Co. has become "attached" to Narmco 3143 putty, which also serves as an adhesive. Ryan saves more than $10,000 per year by bonding items such as shims, spacer blocks and pin bushings. These items formerly required time-consuming drilling and tapping for screws—that often distorted shim surfaces.

Mist Spray Cools Rotors

Experiments in cooling the rotor blades of a gas turbine—by spraying a mixture of water and air—yield promising results. Small tubes of an elliptical cross-section are inserted into the guide vanes. Fine holes in these tubes eject water which mixes with the air used for internal cooling of the vanes. The resulting air-water spray is directed on the rotor blades.

Meet High Temperatures

Low-chrome austenitic steels offer promise in reducing loss of impact strength in high-temperature piping. Experiments indicate chromium content should be less than 19.5 pct for 1150°F service and 18.5 pct for 1250°F service.

New Economic Relationship

Slumping steel orders have caused some producers to wonder if a new relationship may not have been established between basic industry and the overall economy. With so many workers now employed outside production, some people feel that it may now be possible to have a general business boom while steel and other manufacturing groups are slumping.

Improves Missile Accuracy

Beryllium in the housing and other parts of a gyroscope reduce weight of the assembly. This allows for an increase in the mass of the gyro wheel—which increases the wheel's angular momentum. End result is greater sensitivity and accuracy in the guidance systems for intercontinental ballistic missiles.

Weld Refractory Metals

Key to the successful welding of refractory metals such as molybdenum and tungsten is an electron beam welder. Engineers at Republic Aviation Corp. find that the electron beam unit produces non-brittle joints. Reason? The equipment operates in a high vacuum and closely controls grain size, fusion and heat-affected zones.

Smooth Out the Hump

General Motors, Ford and Chrysler are all testing transaxle units. But GM is expected to be the only one that will come up with a transaxle for front-engine cars in the next model year. Three GM makes will probably be fitted with it in 1961. Key to GM's unit: A round solid-steel shaft less than 1-in. diam., that links the front engine with the automatic transmission in the rear. Result is a flat floor with no interior humps or tunnels.

Aluminum Poses Problems

Some barriers to aluminum engines are melting away. Tests show that engine coolants are no real problem. Similarly, machining aluminum on transfer units finds carbides readily whipping the supposed abrasive barrier. But other tricky problems remain to be solved. These include: disposing of sticky chips, high scrap from scuffing and marring of machined surfaces.

We're all going to STRIPPIT this year!

For a fresh slant on ways to work metal, be sure to see our machines in action at our booth. See how our self-contained punching units eliminate expensive dies, how the Flex-O-Drill sharply reduces template-making time, how our versatile Fabricators simplify pilot and production runs. If you can't make the show, write for General Catalog.

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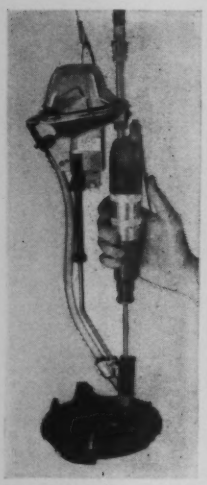

STRIPPIT ZIPP SCREW FEEDER feeds and drives all kinds of screws automatically, saves time and trouble on continuous vertical screwdriving operations.

STRIPPIT SUPER "30" FABRICATOR, a 30" throat version of well-known Model 15A. Handles sheets 30" wide for short run punching, 25" x 30" for production hole duplication. Maximum hole sizes: 3½" in 16 ga. and ½" in ¼" mild steel.

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LETTERS FROM READERS

The Professional

Sir:—The further I read into "Do Professional Employees Require Special Handling?" in your March 17, 1960 issue, the more irate I became. In my opinion, the premises of the article were compounded with double think of an Orwellian cast. Below I give some of my ideas on the subject.

1. What proportion of U. S. firms include their technical management as a part of their boards of directors? Probably a much lower proportion than there should be. After all, the corporate management is as dependent on its technical department for development of new products and processes as it is dependent on financial and marketing specialists for optimum results in these areas, yet the technical group is usually unduly subordinated.

2. The demand for broader education in our institutions of higher learning has given the technically trained individual the realization that he need not take an economic penalty for doing the work he likes best and can do best. Once this idea takes root, such a person will not be satisfied with a pat on the back, coupled with an economic penalty.

3. Inadequate supplies of the technician-level employees will persist as long as production plant floor sweepers, helpers, etc. receive a higher wage rate than do the technicians. Yet this condition is far too frequent and contributes to the necessity of using graduates for work that technicians can handle and the resultant, morale problems.

4. Professional employees are hired for their "brain-power," yet management complains when management practises that do not recognize this intelligence fail to work or work at a definite cost in morale.

5. Starting level salaries have increased nearly 100 percent in the last 10 years, yet readjustment of salary scales for more experienced personnel have not been correspondingly adjusted. This can and does lead to unnecessary turnover in personnel, since the only way an individual can get partially out of this salary trap is by changing companies.

6. Corporations make a big thing out of obtaining patents but usually the reward for the inventor is only a token of one dollar or some such figure. An incentive more in keeping with the potential value of such inventions would be a strong motivation for keeping the necessary records and careful development of ideas.

7. Frequently employees are told their pet ideas are uneconomical, yet the employee is deliberately kept uninformed as to just why it is. The acceptance of such a refusal would occur more readily if the employee were told why it was uneconomical.

8. A big thing is made of stock option plans for management, most members of which cannot be considered creative in the same sense that competent members of the technical departments are creative, and yet these options are supposed to encourage "creativity." Persistence in present modes of thinking is apt to cause a revolt of the technologists of the type so well described in Ann Rand's "Atlas Shrugged."—Name withheld.

"Wertz, show Mr. Ansthruther around the plant."

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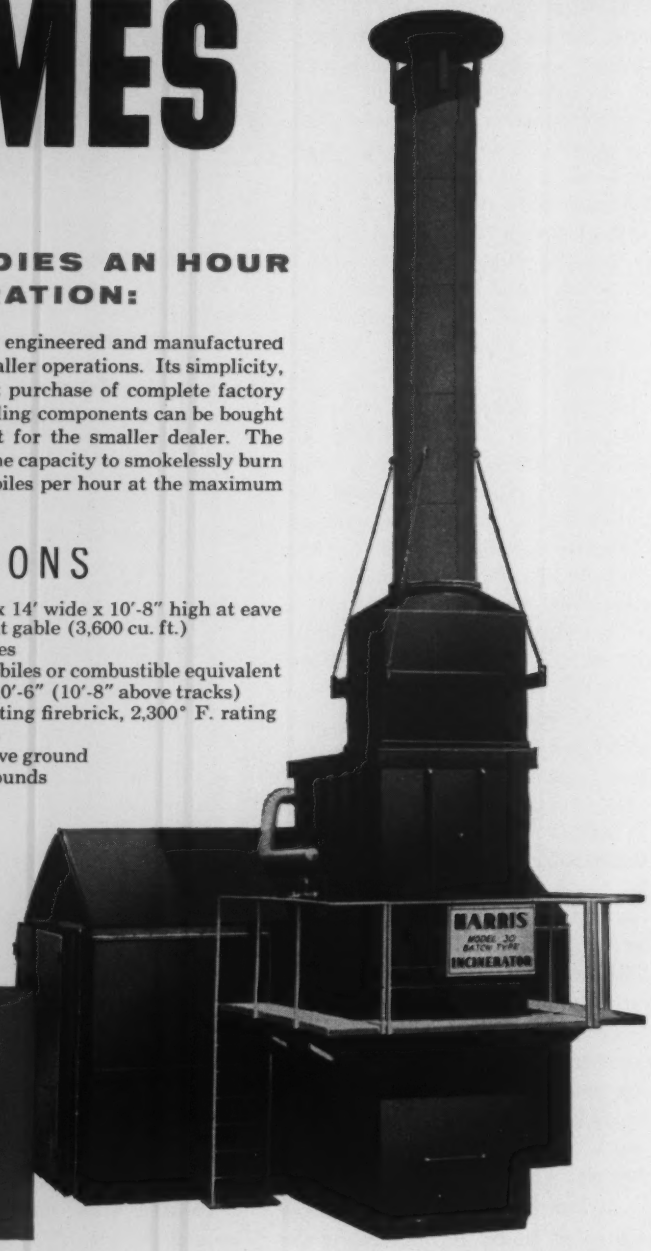
Harris Model 30 Batch Incinerator

CONTROLS SMOKE AND FUMES



HANDLES 4 AUTO-BODIES AN HOUR ...CONTINUOUS OPERATION:

This first of a complete line of incinerators being engineered and manufactured by Harris is intended to meet the needs of the smaller operations. Its simplicity, overall cost, and flexibility of installation permit purchase of complete factory built unit, or if you prefer, the major and controlling components can be bought separately. This provides an ideal arrangement for the smaller dealer. The exceptionally effective afterburner provided has the capacity to smokelessly burn all combustible matter, except tires, in 4 automobiles per hour at the maximum firing rate of 40 gallons of #2 fuel oil per hour.

SPECIFICATIONS

Kiln size	20′ long x 14′ wide x 10′-8″ high at eave 14′ at gable (3,600 cu. ft.)
Burning time	25 minutes
Hourly capacity	4 automobiles or combustible equivalent
Door openings	11′-0″ x 10′-6″ (10′-8″ above tracks)
Afterburner lining	9″ insulating firebrick, 2,300° F. rating
Stack diameter	36 inches
Stack height	35 ft. above ground
Estimated weight	55,000 pounds

Talk with a Man from Harris

HARRIS FOUNDRY & MACHINE CO.

Since 1889

CORDELE, GEORGIA

FATIGUE CRACKS

Wrapped to Sell

A package used to be just a way of wrapping things up. But no longer. Our man just back from the National Packaging Conference and Exposition in Atlantic City (see story on p. 123) found there's little today's packaging experts can't do.

Walking the aisles at the show, he spotted an "iceless icebox" (a foil-lined carton which keeps beer cold for six hours or more); a push-button protective cap, which pops off at a touch for medical injections; and a brushless dentifrice—a tablet wrapped in aluminum foil which one chews to clean teeth.

Packaged Spirits—The number of fascinating containers was almost beyond count. There were eggs packaged in shiny, easy-opening aluminum shells; wrappers which give off faint scents of the product inside, such as chocolate, newly baked bread, or fresh linen; and boil-in-a-bag containers in which whole meals can be cooked without using a skillet or pan.

For the man who can't reach a bar, research is going forward on a plastic pouch holding an individual martini or manhattan cocktail.

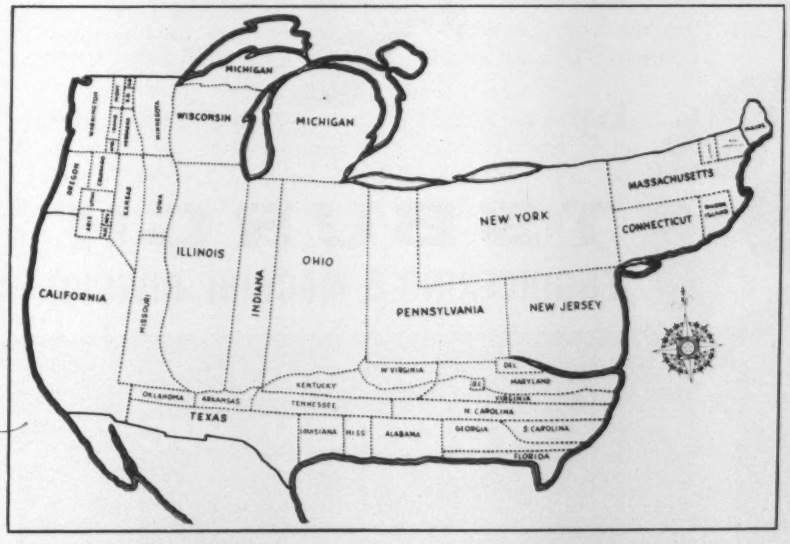
There were also some new wrinkles in show technique in evidence. Our man enjoyed the "Gator-Ride." At the International Paper Co. booth visitors sat in audio-equipped chairs and were carried on a moving belt through the entire 206-foot exhibit

Bulge to the West

If you scale the states by their industrial size and put them on a map (see below) the result is a market-oriented view of the United States that may hold some surprises for you.

Last year The IRON AGE brought you more than two articles on marketing every month, added a weekly "Market-Planning Digest" page. All of which reflects the growing trend toward marketing as a major factor in moving more goods.

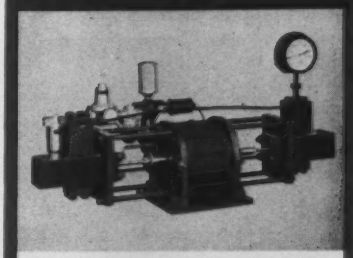
So we're happy to add to the growing volcano of material on this hot subject. This map was made by the Russell T. Gray agency in Chicago as one way of showing their clients the changing face of American industry. They've done this twice before, using 1947 and 1954 census data.



INDUSTRIAL MARKET: Rating states on basis of value added by manufacture from 1957 Census gives unusual industrial picture of the USA.

ALDRICH

AIR-DRIVEN HYDRAULIC PUMPS



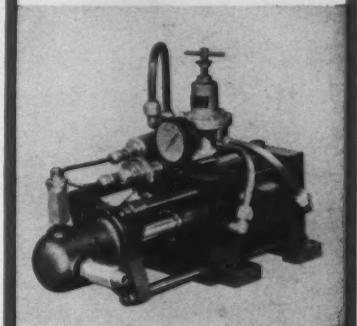
For production service: Heavy duty 6-inch stroke pump, single or double acting.

For production or laboratory . . . handling small volumes of fluid at pressures up to 50,000 psi.

For hydrostatic testing . . . tubing, valves and pressure vessels.

For operating hydraulic presses, cylinders and valve positioners.

Immediate shipment from factory stock.



For intermittent service: 3-inch stroke pump has low first cost, high reliability.

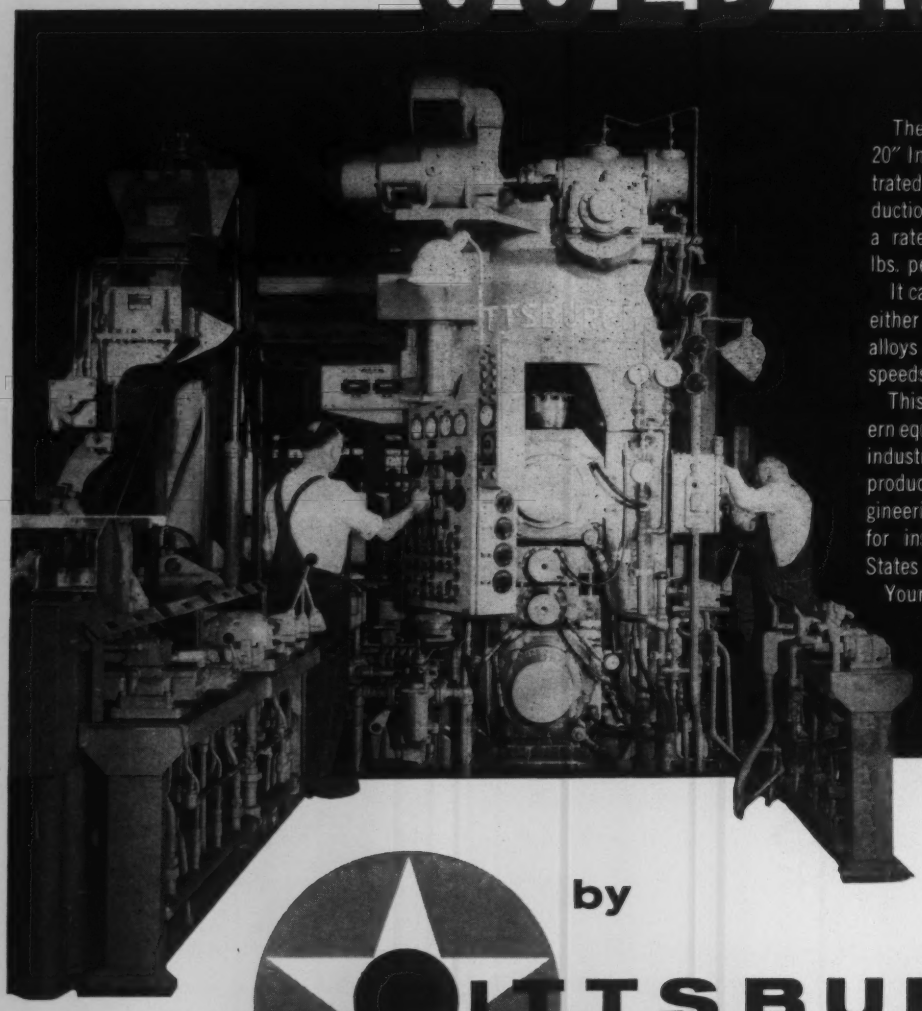
Aldrich air-driven hydraulic pumps operate on normal plant air. They are compact, simple to install, economical to operate. Write today for Data Sheet 36 (6-inch stroke) or Data Sheet 36A (3-inch stroke).

ALDRICH

ALDRICH PUMP COMPANY
8 PINE STREET, ALLENTOWN, PA.

4 High Non-Reversing

COLD MILL



The Pittsburgh 8½" x 24" x 20" Intermediate Cold Mill illustrated is now in continuous production in the Chicago area with a rated capacity of 18,000,000 lbs. per year.

It can be used for reduction of either non-ferrous or ferrous alloys at your required rolling speeds.

This mill is typical of the modern equipment for the rolling mill industry now being designed and produced by Pittsburgh Engineering and Machine Division for installation in the United States and other countries.

Your inquiries are invited.

Electric and open hearth steel castings from 1 lb. to 100 tons

by

PITTSBURGH

ENGINEERING & MACHINE DIVISION

HEAVY MACHINING FACILITIES

Our plant is equipped with a superior complement of well diversified machine tools that are available on a continuing basis for economical machining of heavy castings or the manufacture of auxiliary rolling mill equipment, such as heavy mill tables, furnace pushers, slab depilers, downcoilers, ingot buggies, slab transfers, etc.

Pittsburgh Steel Foundry Co.

TEXTRON, INC.

504 FORBES AVENUE

PITTSBURGH 19, PA.

COMING EXHIBITS

Tool Show—April 21-28, Detroit Artillery Armory, Detroit, (American Society of Tool Engineers, 10700 Puritan, Detroit 38.)

Powder Metallurgy Show — April 25-27, Drake Hotel, Chicago. (Metal Powder Industries Federation, 60 E. 42nd St., New York.)

Welding Show—April 25-29, Great Western Exhibit Center, Los Angeles. (American Welding Society, Inc., 33 West 39th St., New York 18.)

1960 Castings Congress & Exposition—May 9-13, Convention Hall, Philadelphia. (American Foundrymen's Society, Golf & Wolf Rds., Des Plaines, Ill.)

Southwestern Metal Show — May 9-13, State Fair Park, Automobile Bldg., Dallas, Texas. (American Society for Metals, Metals Park, Novelty, O.)

Design Engineering Show — May 23-26, Coliseum, New York. (Clapp & Poliak, Inc., 341 Madison Ave., New York 17.)

Production Engineering Show — Sept. 6-16, Navy Pier, Chicago. (Clapp & Poliak, Inc., 341 Madison Ave., New York 17.)

Machine Tool Exposition—Sept. 6-16, International Amphitheatre, Chicago. (National Machine Tool Builders Assn., 2139 Wisconsin Ave., Washington 7, D. C.)

Iron & Steel Show—Sept. 27-30, Cleveland Public Auditorium, Cleveland, O. (Association of Iron & Steel Engineers, 1010 Empire Bldg., Pittsburgh 22.)

MEETINGS

APRIL

American Machine Tool Distributors Assn.—Spring meeting, Apr. 18-20, The Greenbrier, White Sulphur Springs, W. Va. Association headquarters, 1500 Massachusetts Ave., N. W., Washington 5, D. C.

American Society of Lubrication Engineers—Annual meeting, April 19-21, Netherland-Hilton, Cincinnati, Society headquarters, 5 North Wabash Ave., Chicago.

National Assn. of Sheet Metal Distributors — Spring meeting, April 20-22, Deshler Hilton Hotel, Columbus. Association headquarters, 1900 Arch St., Philadelphia.

Rail Steel Bar Assn. — Annual meeting, April 20-22, Palm Beach Biltmore Hotel, Palm Beach, Fla. Association headquarters, 38 S. Dearborn St., Chicago.

American Ceramic Society — Annual meeting, Apr. 24-28, Bellevue-Stratford Hotel, Philadelphia. Society headquarters, 4055 N. High St., Columbus 14, O.

Metal Powder Industries Federation—Annual meeting, April 25-27, Drake Hotel, Chicago. Headquarters, 60 E. 42nd St., New York.

Association of Iron & Steel Engineers—Spring meeting, April 25-27, Sheraton Hotel, Philadelphia. Association headquarters, 1010 Empire Bldg., Pittsburgh.

Metal Lath Mfrs. Assn. — Spring meeting, April 28-29, Hotel Tropicana, Las Vegas, Nev. Association headquarters, Engineers Bldg., Cleveland.

MAY

Wire Assn. — Regional meeting, May 4-5, Sheraton Hotel, Philadelphia. Association headquarters, 453 Main St., Stamford, Conn.

American Institute of Steel Construction, Inc.—Engineering conference, May 5-6, Brown Palace Hotel, Denver. Institute headquarters, 101 Park Ave., New York.

FOR VARIETY
STANDARDIZE 100% ON SOUTHERN FASTENERS
A stock of 1,500,000,000 USA-made fasteners means that Southern's variety of items, sizes, materials, head styles and finishes can be your source of constant supply. Standardize 100% on Southern fasteners, and forget about carrying a large, costly, space-consuming inventory. Let Southern's variety and famous service help solve your fastener problems.
It will pay you to try Southern on your next order. Write today, using your letterhead, for our Stock List showing current variety of fasteners ready for delivery in large or small quantities. Address Southern Screw Company, P. O. Box 1360, Statesville, North Carolina.
Manufacturing and Main Stock in Statesville, North Carolina
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Southern
SCREW COMPANY

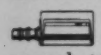
New Money Makers for Industry:

KIN TEL CLOSED CIRCUIT TV SYSTEMS

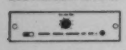
what they are, and what they can can do for you...

What is a KIN TEL Closed Circuit TV system?

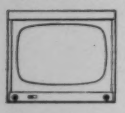
The basic closed circuit television system manufactured by KIN TEL consists of a camera, a camera control unit and a monitor (receiver) each connected by cable. The camera can be located at great distances from the monitor, and any combination of cameras and monitors can be used.



The camera is small enough to hold in your hand; rugged enough to operate in 150° F. without a protective housing; sensitive enough to provide excellent pictures of objects illuminated by only a candle.



The camera control provides automatic operation. The system is continuously self-adjusting for wide variations in light levels (several thousand to one), and features automatic high definition of bright objects. The only control you have to touch is the on-off switch.

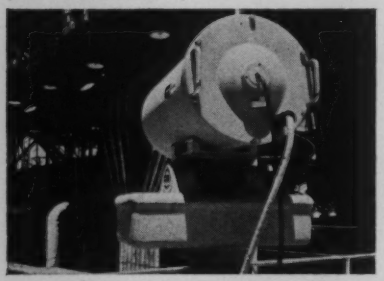


The monitor displays a crisp, clear picture...full 650-line resolution, twice that of the best home TV reception.

How are such systems used?

Today, KIN TEL closed circuit TV systems are performing a number of jobs for *hundreds* of firms, safely, inexpensively, tirelessly.

They are being used to watch operations or events that are tedious, difficult, dangerous, or even impossible for men to watch.



For example: Convair (above), Douglas, Lockheed and Northrop watch rocket tests with KIN TEL systems. U.S. Steel uses one to see inside open hearth furnaces. Westinghouse watches nuclear power reactor tests with one.

They are being used for surveillance.

For example: The San Francisco Naval Shipyard uses one to guard against pilferage.

They are being used for traffic control.

For example: The Alameda Naval Air Station uses a KIN TEL TV system to observe aircraft landings on the portion of the runway that is not visible from the control tower.

They are being used to transmit visual information quickly and accurately; for remote observation of charts, meters, graphs, schedules, blueprints, photographs, images from microscopes, fingerprints, signatures...the list is almost endless.

For example: E. F. Hutton uses a KIN TEL system to transmit stock market quotations to the offices of the firm's executives. The Los Angeles Department of Water and Power uses one for remote viewing of water-level meters. The University of California teaches physics with one.

They are being used for monitoring any operation that normally requires standby personnel.

For example: American Potash and Chemical (above) monitors conveyor line and warehousing operations with a KIN TEL TV system.

Why do these firms choose a KIN TEL system?

For a variety of reasons.

First, *reliability.* KIN TEL TV is designed for continuous duty operation in severe environments. Day in and day out, it keeps working. It's the first choice for ICBM and other missile programs that really depend on TV, that can't chance failure, that can't afford to compromise with reliability.

Second, *picture quality.* KIN TEL TV presents clear, sharp pictures. Full 650-line resolution provides maximum data...essential for *quantitative* observation of complex operations or transmission of printed material.

Third, *automatic operation.* KIN TEL TV is the only closed circuit system that provides entirely automatic, through-the-lens compensation for light-level changes of several thousand to one.

Fourth, the KIN TEL closed circuit TV system is extremely *sensitive.* The light required to read this page is enough for sharp clear pictures, and usable pictures can be provided with less than one-foot candle illumination.

Fifth, KIN TEL TV systems are *easy to install* and *simple to operate.* With no changes in lens iris to make, with no difficult, interacting electrical adjustments required, the only thing the operator has to know is the location of the on-off switch.

Sixth, a *complete* line of shelf-item system components and a variety of cameras and monitors make virtually any application feasible...permit observation of nearly every kind of operation, under all kinds of conditions.

For example, with system components, you can remotely position the camera, remotely select one of several lenses, remotely "zoom" in or out for closeup or wide-angle viewing, operate the camera in extremes of temperature or in explosive or dusty atmospheres, view microscope images. Whatever your viewing problem, KIN TEL probably has a *stock* solution.

Seventh, you don't have to waste your time and money on application engineering. At no obligation to you, KIN TEL's nationwide factory-trained field engineers – thoroughly experienced in optics, environmental requirements, lighting, cabling, human engineering factors, and other installation considerations–can determine whether or not closed circuit TV can be put to profitable use in your intended application.

What can a KIN TEL system do for your business?

It can do what it is doing right now for hundreds of other firms. It can save you time and money...increase efficiency...better your service to clients and customers. To find out how, write direct for catalog 6-103 and the name of your nearest KIN TEL engineering representative.

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KIN TEL–pioneer and leader in closed circuit television.

APRIL, 1960
Vol. 7 No. 1

NATIONAL CARBON COMPANY'S

CARBON AND GRAPHITE NEWS

R-N BRIQUETTES...an electric furnace charge material of uniform composition

By W. R. Weaver

R-N BRIQUETTES...an electric furnace charge material of uniform composition

W. R. WEAVER, Director,
Steel Conservation and Quality Control
Republic Steel Corporation

The need for a suitable charge material from direct reduction of iron ores – for both electric and open hearth furnaces – is more pressing today than it has been in the past several years. The R-N Process – a joint project of Republic Steel Corporation and National Lead Company – has to date produced a large quantity of briquettes which have undergone intensive testing. These briquettes offer electric furnace steelmakers the following advantages.

- **A charge material produced from either low or high grade ores.**
- **A charge material that is easy to handle and store.**
- **A charge material that can effectively replace up to 60% of ordinary heavy scrap grades.**
- **A charge material of uniform composition.**
- **A charge material with the stable cost of a manufactured product such as pig iron.**
- **A charge material low in deleterious impurities.**

Introduction

In the steel industry today, one of the surest paths to success with a new material is to provide a product that can be handled in less time and with less care than the material it replaces. R-N briquettes, with a bulk weight of 225 pounds per cubic foot and good strength, permit easy handling and storage because of very small space requirements. An equally favorable factor is that briquettes can be loaded easily into buckets or boxes for charging.

The R-N briquette – a product of directly reduced ore in the R-N Process – appears after numerous tests to be an efficient and effective charge material for the electric furnace. The product can be produced from either low or high grade ore, and offers many advantages as a replacement for up to 60% of ordinary heavy scrap grades in electric furnace operations.

Melters are provided with a charge material with both uniform density and electrical conductivity. This makes for improved operations because nonconducting spots are

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View of the rotary kiln at the Pilot Plant in Spaulding, Alabama.

eliminated from the charge—a very important factor where heavy power is employed for melt-down.

These briquettes are uniform as to composition and are free from harmful incidental alloying elements. This means melters can proceed with much more speed toward the completion of each phase of the melting operation. Freedom from dirt and contamination results in smaller slag volumes. Even where molten pig iron is used, slag volumes are a problem because of the presence of the slag-forming elements such as silicon and phosphorous.

In addition to uniformity of product, industry gains a charge material that will be uniform in price. The cost of producing R-N briquettes cannot be generalized because these figures are associated with a given location and with the treatment of a given type of raw material. However, the product that R-N briquettes offer the steelmaking industry is a charge material of uniform cost comparable to a manufactured product such as pig iron.

ADVERTISEMENT

R-N Briquettes Have Been Thoroughly Tested

To date, approximately 60,000 tons of briquettes have been produced at the Pilot Plant at Spaulding, Alabama. The material has been tested in substantial quantities in the blast furnace, in the open hearth, and in the electric furnace. This article covers testing procedures and results in Republic Steel Corporation's electric furnaces.

Two major melting tests (employing a total of approximately 3,385 tons of R-N briquettes) were conducted in Republic Steel Corporation's Chicago District electric furnaces. The first test was carried on in a 20′ shell – 85 ton, top-charge electric furnace from February 18, to April 14, 1957. The second test was conducted in a 22′ shell – 135 ton, top-charge electric furnace from September 18, to October 10, 1958. In both instances, R-N briquettes were utilized as a straight replacement for scrap with no pig iron being employed.

Melting Test Number One

A total of 2,064 net tons of briquettes produced from Port Henry concentrates were shipped to Republic Steel Corporation's Chicago District for melting tests in an electric furnace. The instructions to the melt shop were "to examine the melting characteristics of R-N briquettes as a straight replacement for scrap in an electric furnace." A number of heats were made using varying percentages of R-N briquettes. The results of these heats were compared to those from companion heats in which no R-N was charged to determine the differences in the melting performance as the percentage of scrap replacement by R-N briquettes in the charge was increased from 20%, through 30%, 40% and 50%, up to 60%. It should be stressed that the data presented here are centered on the 40% level, which was the level decided upon by operating supervision as the one most desirable for the accumulation of data.

The briquettes used were 3¾″ diameter round slugs, 3″ to 4″ thick, weighing from six to seven pounds each. The top and bottom surfaces were flat and parallel, creating a strong tendency to nest or stack inside the electric furnace.

TABLE I

R-N Melting Test Number One

All Cold Charge — 40% R-N — 20′ Shell — 85-Ton — Top-Charge Furnace

Summary of Operating Data

Per Heat — Averages of 13 Heats	Control Heats	R-N Heats
Materials Charged — Pounds		
No. 1 Heavy Melt	186,000	113,600
R-N Briquettes	—	72,600
Total Scrap	186,000	186,200
Carbon	738	2,269
Power — K.W.H. Per Ton		
Charge to Melt	484	531
Charge to Tap	525	576
Times — Hours		
Adjusted (Less Delays)		
Charge to Melt	3.84	3.95
Charge to Tap	4.86	4.94
Patching Time	24	21
Tons Per Hour (Total Tapped)		
Charge to Tap — Actual	17.8	17.1
Tap to Tap — Actual	16.0	15.4
(Less Delays)		
Charge to Tap	19.00	18.33
Yields — %		
Gross Product Yield	94.13	93.33
Pounds Per Ton — Total Tapped		
Feed Ore	80.5	58.8
Burnt Lime	80.0	91.1
Chemistry — Steel		
Carbon at Melt	0.26	0.29
Carbon Drop — Melt to Tap	0.10	0.06
Manganese at Tap	0.19	0.14
Final:		
Phosphorous	.010	.012
Sulphur	.032	.030
Total Incidental Alloys	.38	.32
Slag:		
At Tap: FeO	22.29	23.61
TiO_2	0.57	2.61

Data from the first test are shown in Table I. In general, the R-N briquettes were observed to perform very similarly to regular heavy melting scrap such as crops or bloom butts. The advantages and liabilities due to the chemical and physical nature of the R-N product are shown in Table II.

Heat Time (charge to melt or charge to tap)	Stand-off
Bottom Repair Time	Stand-off
Power Consumption	Slight increase
Carbon required in charge	Slight increase
Ore Consumption	Saving
Metallurgical yield	Stand-off
Melt-in phosphorous	Advantage
Melt-in sulphur	Advantage
Total residual tramp alloys	Advantage

Table II. Advantages and liabilities of R-N material due to chemical and physical nature of the product.

Lower than normal yields were expected for two reasons. First, clean electric furnace melting scrap is generally conceded to be about 98% Fe, whereas the R-N material used averaged 95.30% Fe when unloaded into stock. Second, the R-N heats were under-charged deliberately to prevent any spillage that might occur due to the gentle boiling action caused by iron oxides present in the R-N material. The briquettes contained 8.3% of the iron as oxides in their various forms. In spite of this, the slags produced were not very different from those of the all-scrap heats and the bath boiling action produced a desired circulation of the metal. A point of interest to melters and furnace operators is that such action is favorable to the development of uniform temperature throughout the bath and speeds up removal of carbon.

The iron oxides contained in the R-N briquettes provided self-oreing characteristics. This meant that when R-N product was used as a charge material to replace scrap, if all other factors were maintained in balance, lower melt-in carbons would result. It was necessary, therefore, to charge supplemental carbon in the R-N heats. Broken electrodes were used for this purpose.

The pounds of ore consumed per net ton of steel tapped are consistently lower on the R-N than on the comparison heats. In spite of this, as noted above, melt-in carbons are generally lower.

It has been assumed that regularly established shop practices produced satisfactory melt-in carbons. For the R-N heats to be melted at carbon levels equivalent to the regular heats, even less ore than actually used would have been required.

Table I shows that heats made with R-N briquettes produced lower values for sulphur and total residual alloys than did regular scrap heats. These reduced levels are a definite advantage for the R-N heats over the regular scrap heats.

A car being loaded with R-N briquettes for shipment to Republic Steel Corporation's Chicago District for melting tests in an electric furnace.

Melting Test Number Two

To supplement and substantiate the data obtained during the first tests, a second series of test heats was scheduled during September and October of 1958.

Because of shop operating conditions, one important factor had to be modified in the second test. Since the time of the first test, three electric furnaces had been enlarged from 85-ton to 135-ton rated capacity. Only the latter furnaces were available at the time of the second test. This difference in furnace capacity in the two tests must be kept in mind.

A total of 1321 net tons of R-N briquettes produced from Port Henry concentrate were melted in twenty heats producing 3,030 net tons of ingots. The material was similar chemically to that used in the first test, but the physical shape of the briquettes had been modified. The top face of these briquettes was curved and hence the top and bottom faces were no longer parallel. A minimum tendency toward nesting and stacking inside the furnace was observed as a result of this physical shape modification.

The entire test pattern was designed to improve quality of the data obtained over that of the first test. Particular stress was applied on yield and power consumption data. All the metal tapped was weighed and ingots were weighed individually on a specially installed scale. Skulls, spills and even pit scrap were weighed. Short ingots or butts were measured. Specially designed power monitoring and data logging equipment was installed to provide a reading every minute on the power consumed by each individual electrode. Meters were carefully calibrated and presented readings within an accuracy of 1%. A special observer supervised the weighing of all materials, both charged and produced. A second observer was assigned to the power monitoring equipment, and an experienced metallurgical observer covered and logged all details of the furnace operations. All of these activities were supervised on a twenty-four hour basis.

Heats were made in "blocks" of five heats each. An equivalent number of regular or "control" heats were made. The test blocks of five heats each were alternated between R-N and control heats to insure balancing and randomizing the test conditions and to avoid bias which might otherwise result. This "design of experiment" afforded subsequent analysis of the accruing data on a sound statistical basis and the resultant formulation of conclusions and interpretations with specific degrees of confidence.

A summary of operating data appears in Table III.

TABLE III

R-N Melting Test Number Two

All Cold Charge — 40% R-N — 22′ Shell — 135-Ton — Top-Charge Furnace

Summary of Operating Data

Per Heat — Averages of 20 Heats	Control Heats	R-N Heats
Charge Materials — Pounds		
Heavy Bloom Crops	119,730	—
Other Scrap	186,370	190,545
R-N Briquettes	—	119,486
Total Scrap	306,100	310,031
Burnt Lime	5,565	8,395
Carbon	1,020	3,335
Feed Materials		
Liberian Ore	3,950	4,528
Burnt Lime	3,562	2,205
Total Weight Melted	320,197	328,494
Total Metallics	314,708	318,813
Power — K.W.H. per Ton:		
Good Ingots Only	478	505
To Melt Total Charge	383	419
Total Weight Tapped	448	485
Times — Actual — Hours		
Charge to All Melted	4.50	4.73
Charge to Tap	5.90	6.04
Tap to Tap	6.51	6.50
Fettling Time	0.46	0.43
Adjusted (Less Delays)		
Charge to All Melted	3.94	4.21
Charge to Tap	5.34	5.50
Net Time Power To Furnace:		
Power on to All Melted	3.52	3.74
Power on to Tap	4.71	4.77
Product — Pounds		
Good Ingots Only	284,575	290,753
Total Metal Tapped	302,626	303,040
Pounds Per Ton — Total Tapped		
Feed Ore	28.84	30.46
Burnt Lime	60.29	68.72
Carbon	6.74	21.98
Yields		
Good Ingots Only	90.49	91.20
Gross Product Yield	96.20	95.05
Tons Per Hour (Total Tapped)		
Actual: Charge to Tap	26.03	25.30
Tap to Tap	23.60	23.45
Net: (Less Delays)		
Charge to Tap	28.53	27.72
Chemistry — Steel %		
Carbon at Melt	0.466	0.494
Manganese at Tap	.296	.194
Carbon Drop — Melt to Tap	.133	.174
Final:		
Carbon	.437	.442
Manganese	1.119	1.099
Phosphorous	.0161	.0163
Sulphur	.0353	.0300
Total Incidental Alloys	.339	.262
Slag:		
At Melt: FeO	17.87	15.07
At Tap: FeO	17.31	18.43
CaO	41.48	45.99
MgO	6.65	5.78
SiO_2	16.26	14.56
Al_2O_3	3.95	4.13
P_2O_5	.65	.69
V-Ratio	2.496	2.858

All heats, both control and R-N, were produced under the 100% scrap practice; no pig iron, either hot or cold, was employed.

On all control heats, 40% of the total scrap charged was composed of clean bloom butts or heavy crops. On the R-N heats this class of scrap was replaced with an equal amount of R-N briquettes, thus affording a direct replacement of a specific and stable scrap of known quantity. All heats comprising the test were melted for the same grade of steel and poured in the same size molds.

The results of the second test fortify and validate the conclusions drawn from the initial test. The magnitude of many factors was at a different level than in the original run due to the larger size furnace used and to the greater precision obtained in product weights. When the R-N heats are compared to the control heats, all criteria studied will be found to be in the same "direction" and by roughly the same relative order of magnitude as in the initial test run.

R-N as Straight Scrap Replacement

The data from both tests indicate that in electric furnace operations using an all scrap charge, R-N briquettes are a thoroughly satisfactory substitute for ordinary grades of heavy melting scrap, up to 60% of the scrap charge.

No difficulties were experienced in furnace operation. Heats appeared normal in all respects. A little more power was required to melt the total balanced R-N charge than to melt the scrap charge which it replaced. Most heats required more than the customary amounts of burnt lime. Feed ore consumption was entirely a function of the melt-in and required tapping carbons. The iron oxide content of the R-N product produced noticeably more active bath conditions which is a desired feature. There was no discernible difference in product quality by comparison to shop standards.

Summary of Tests One and Two

Heat Time

Actual times experienced for charge to melt, charge to tap and tap to tap respectively are provided for information purposes only since these are not considered appropriate measures of comparison.

Since there are rather frequent delays on almost all heats which are not necessarily of an unusual nature, but are certainly extraneous to the "normal" melting of a heat and in no way related to the materials themselves, it is appropriate to remove such recorded delays, thus providing a set of *adjusted* or net times. These are shown in Table IV.

	1st Test Run 85-Ton Furnace	2nd Test Run 135-Ton Furnace
Charge to Melt		
Control	3.84	3.94
R-N	3.95	4.21
Charge to Tap		
Control	4.86	5.34
R-N	4.94	5.50

Table IV — Adjusted Heat Times in Hours — Delays removed

R-N heats were slightly longer on the average than control heats, with respect to both charge to melt and charge to tap times. However, it is significant to note that the penalty is small in magnitude.

Tons Per Hour

If produced tonnages are equivalent, a small penalty in tons per hour would result from slightly longer heat times. Since there are always many factors determining what portion of the total metal coming out of the furnace results in good ingots, *total tons tapped* is a more appropriate measure than "good ingots" for a comparison of raw materials. R-N heats produced about the same total product as did the control heats. There is a small tons per hour difference, but it is not statistically significant. This is shown in Table V.

	1st Test Run 85-Ton Furnace	2nd Test Run 135-Ton Furnace
Control Heats	19.00	28.53
R-N Heats	18.33	27.72

Table V — Tons Per Hour — Total Metal Tapped — Adjusted Heat Times

Power Consumption

As was found in the first test run, the R-N heats required somewhat more power than did the control heats. The comparison based on K.W.H. per ton of total metal tapped is shown in Table VI.

	1st Test Run 85-Ton Furnace	2nd Test Run 135-Ton Furnace
Control Heats	525	448
R-N Heats	576	485

Table VI — K.W.H. per ton of Total Metal Tapped

Yields

A comparison of good ingot yields is not considered as meaningful a comparison as the gross product yield. The latter includes ingots, butts, skulls and pit scrap — all the metal produced from the materials used and which came out of the furnace. These figures are compared in Table VII.

	1st Test Run 85-Ton Furnace	2nd Test Run 135-Ton Furnace
Control Heats	94.13	96.20
R-N Heats	93.33	95.05

Table VII — Gross Product — Total Metal Tapped as % of Total Metallics

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The heavy bloom butts which the R-N briquettes replaced can be safely assumed to be 98.0% Fe. The R-N material melted averaged 95.30% Fe, a difference of 2.70%. On a 40% R-N replacement basis, *the R-N heats could be expected to produce 2.70% x 40% or 1.08% lower yields than the control heats.* Thus, there is some evidence of the possibility of a *slight* actual yield liability, over and above the difference in the iron content of the two materials.

Burnt Lime—Feed Ore—Carbon

The additional burnt lime consumed by the R-N heats in the amount of 8.43 pounds per ton tapped is indicated to be a significant difference. However, the fact that more burnt lime was *used* does not necessarily mean that more was *required*. The difference is statistically significant, but could be merely a reflection of how the heats were worked. Slag iron oxides (FeO) were higher on the R-N heats at tap, although they were lower at melt. This fact offers some evidence that the additional lime may have been needed, or at least provides the probable reason for such action by the melting crew. The objective was to charge sufficient additional carbon in the R-N heats to produce melt-in carbons equivalent to the control heats. Since the melt-in carbons were substantially the same, and since all heats were tapped for the same grade of steel, the carbon drop melt to tap would be substantially equivalent. This means the use of feed ore would be approximately the same. Actually, there was a small excess for the R-N heats, but not a significant amount, especially since the R-N heats actually experienced a four-point greater carbon drop from melt to tap.

Significant Items of Steel Analysis

Results show the phosphorous content of both control and R-N heats to be approximately the same. R-N heats had lower sulphur by five points, .030% compared to .035%. Total of incidental alloys (copper, nickel, chromium and molybdenum) was also substantially lower in the R-N heats, 0.262% compared to 0.339%.

Metallurgical Factors

Metallurgical examination disclosed no discernible differences in quality with respect to grain size, cleanliness, soundness, etc. Blooming Mill observation *produced definitely better ratings on surface quality during rolling on the R-N heats. This advantage is ascribed to the five points lower sulphur in a range which is rather critical surface-wise.*

Conclusions

The R-N briquette may be looked upon as a competitor of scrap and, in a way, it is. But in other ways it is not. Scrap is a by-product, the value of which fluctuates widely on a supply and demand basis. Likewise, its quality fluctuates widely and it may contain harmful residual elements. R-N briquettes, on the other hand, show the stable cost patterns associated with a manufactured product such as pig iron. The product is easier to handle, store and charge, and also offers the melter a charge material of uniform composition. For these reasons, the use of R-N briquettes to displace scrap, will undoubtedly prove more efficient and have a stabilizing effect on the price of scrap. This is sure to relieve steelmakers of the dangers resulting from excessive fluctuations in the price of scrap.

It is wrong, however, to look at high grade R-N briquettes as being just a competitor of scrap. Where a new installation is considered, there are indications that the combination of an R-N plant with electric furnaces would in many cases be more economic to operate and would involve less investment costs than a blast furnace-open hearth combination. Under such circumstances the R-N briquettes would be competing both with scrap and pig iron. A detailed discussion of the economics of this situation is beyond the scope of this article; it will suffice to say that it is believed the R-N Process can compete favorably under these circumstances.

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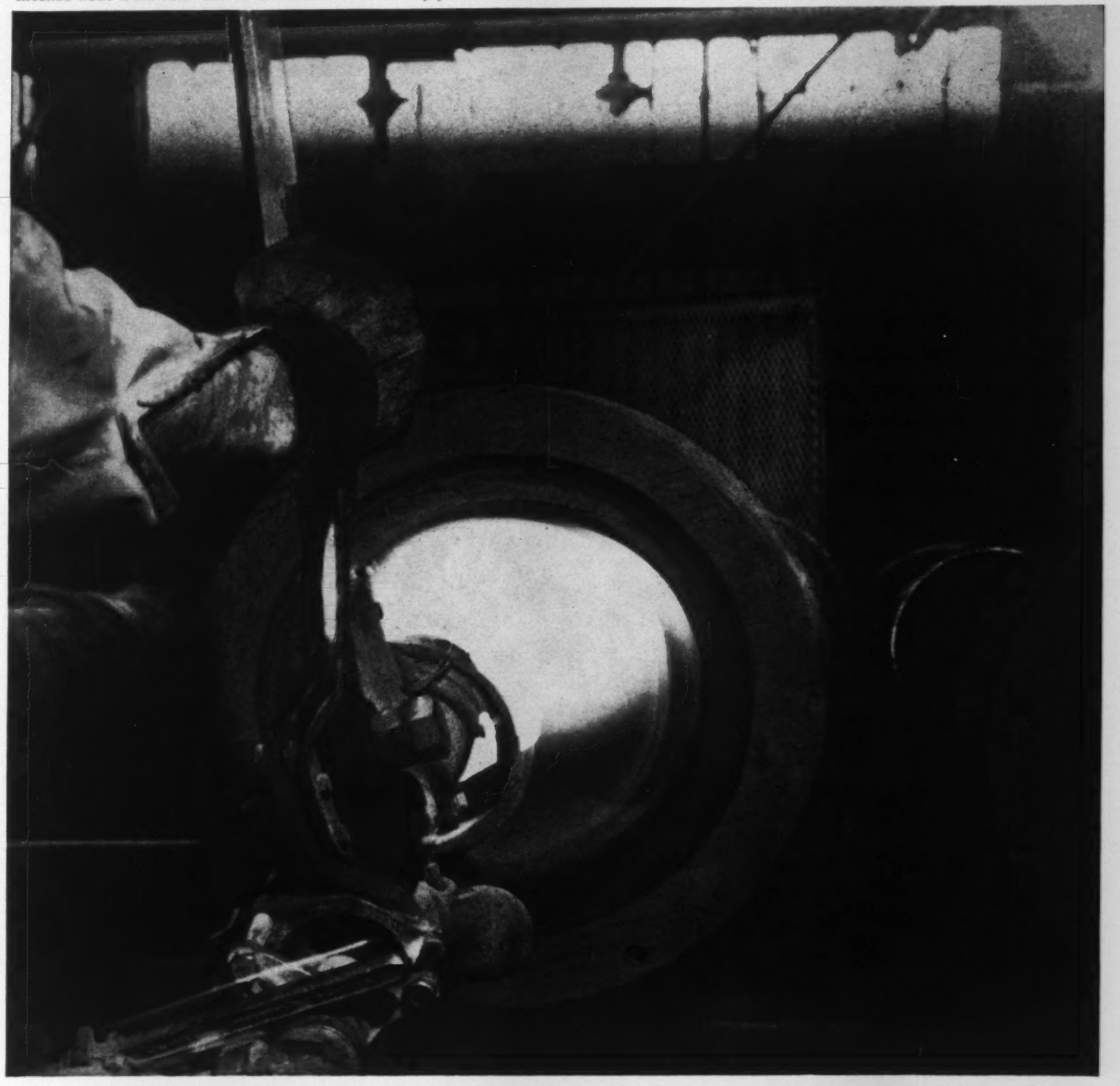

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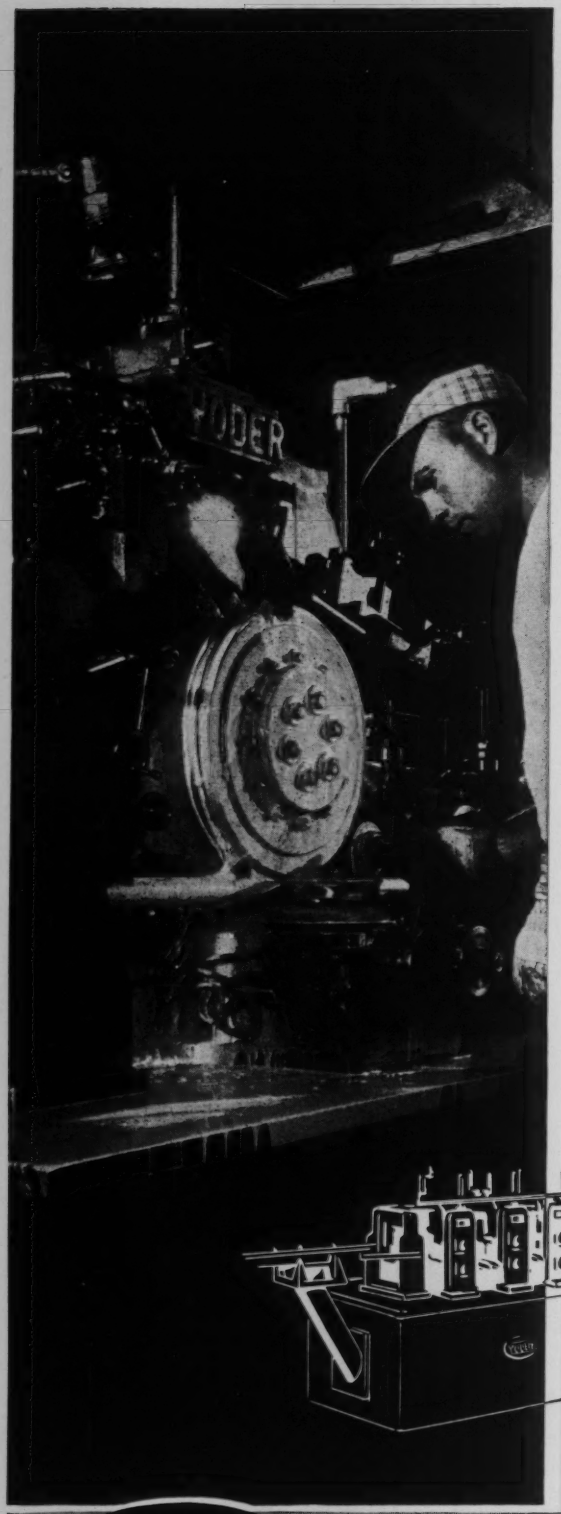

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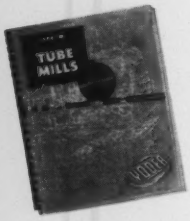

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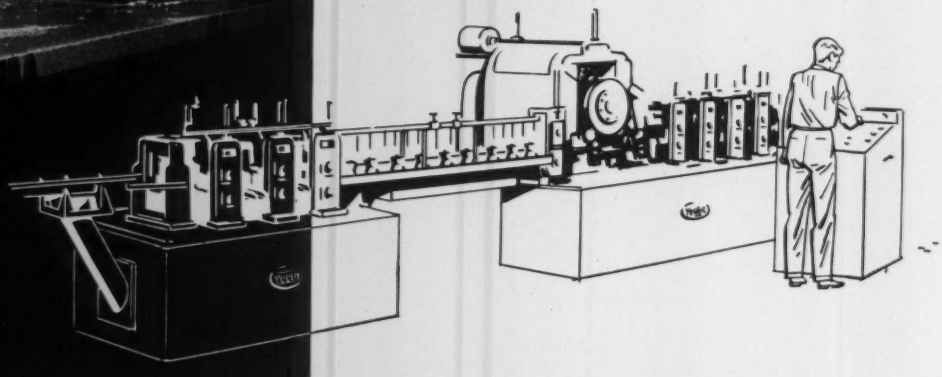

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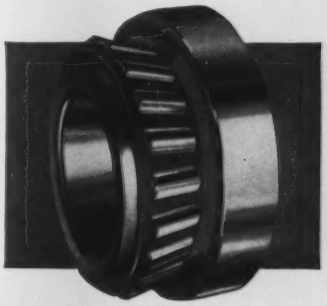

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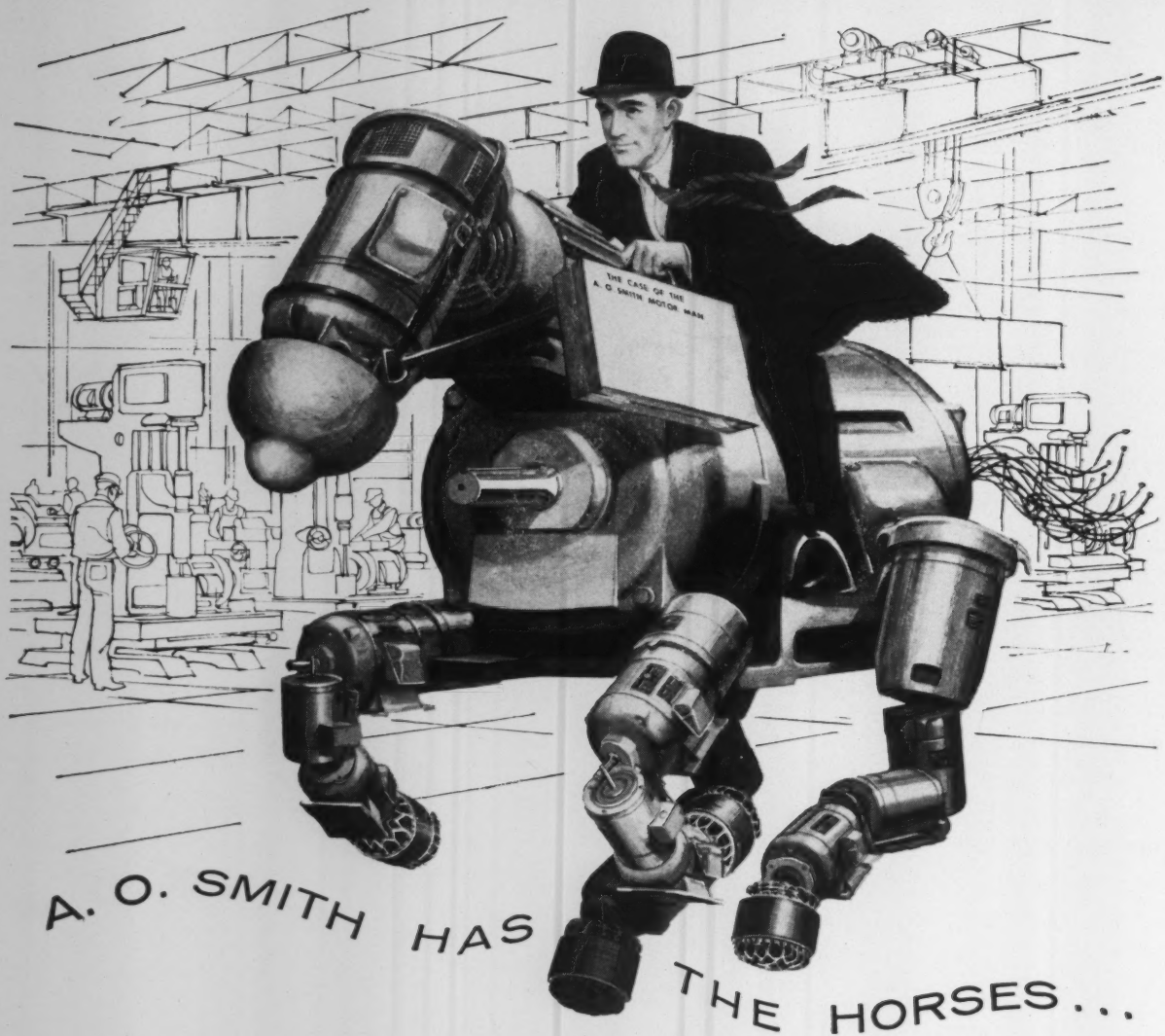

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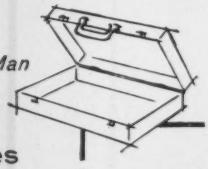

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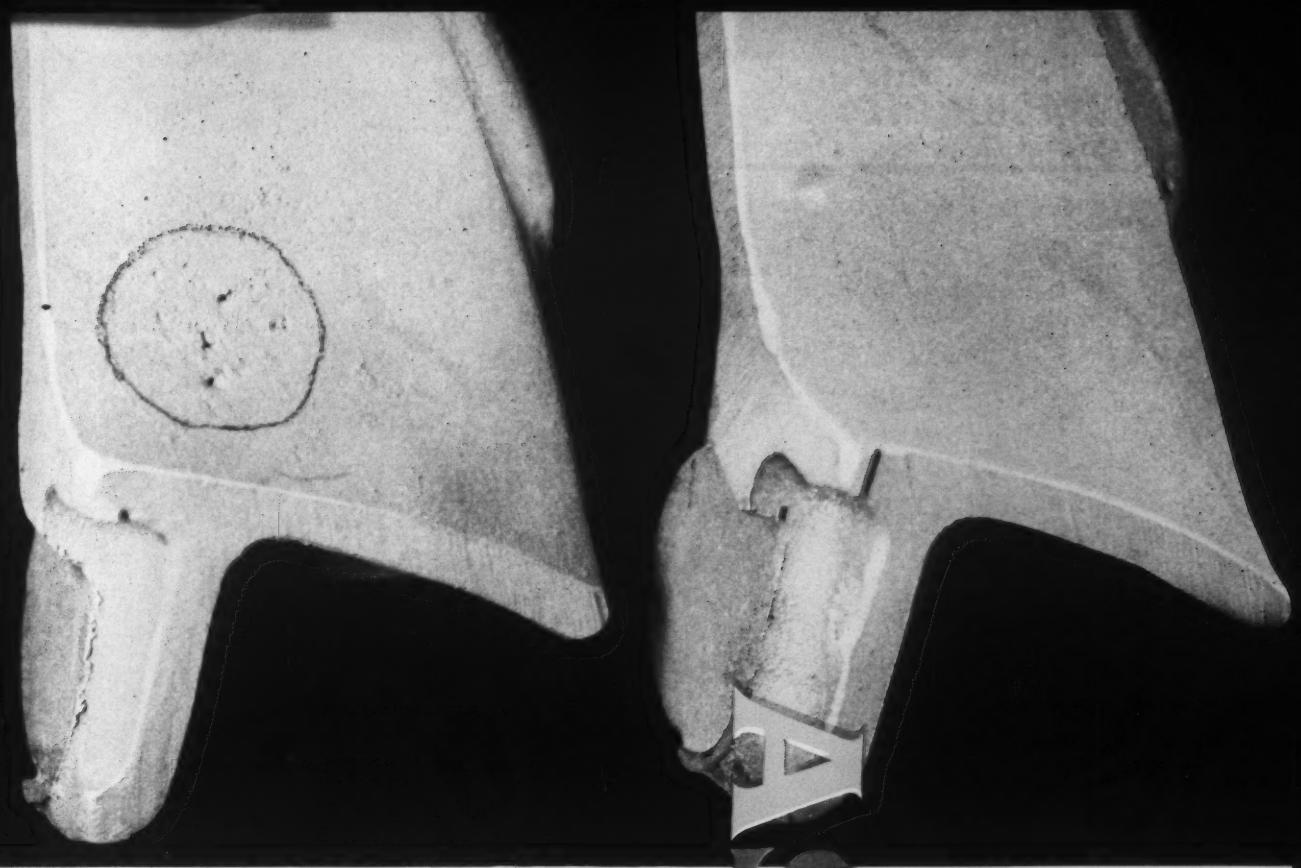

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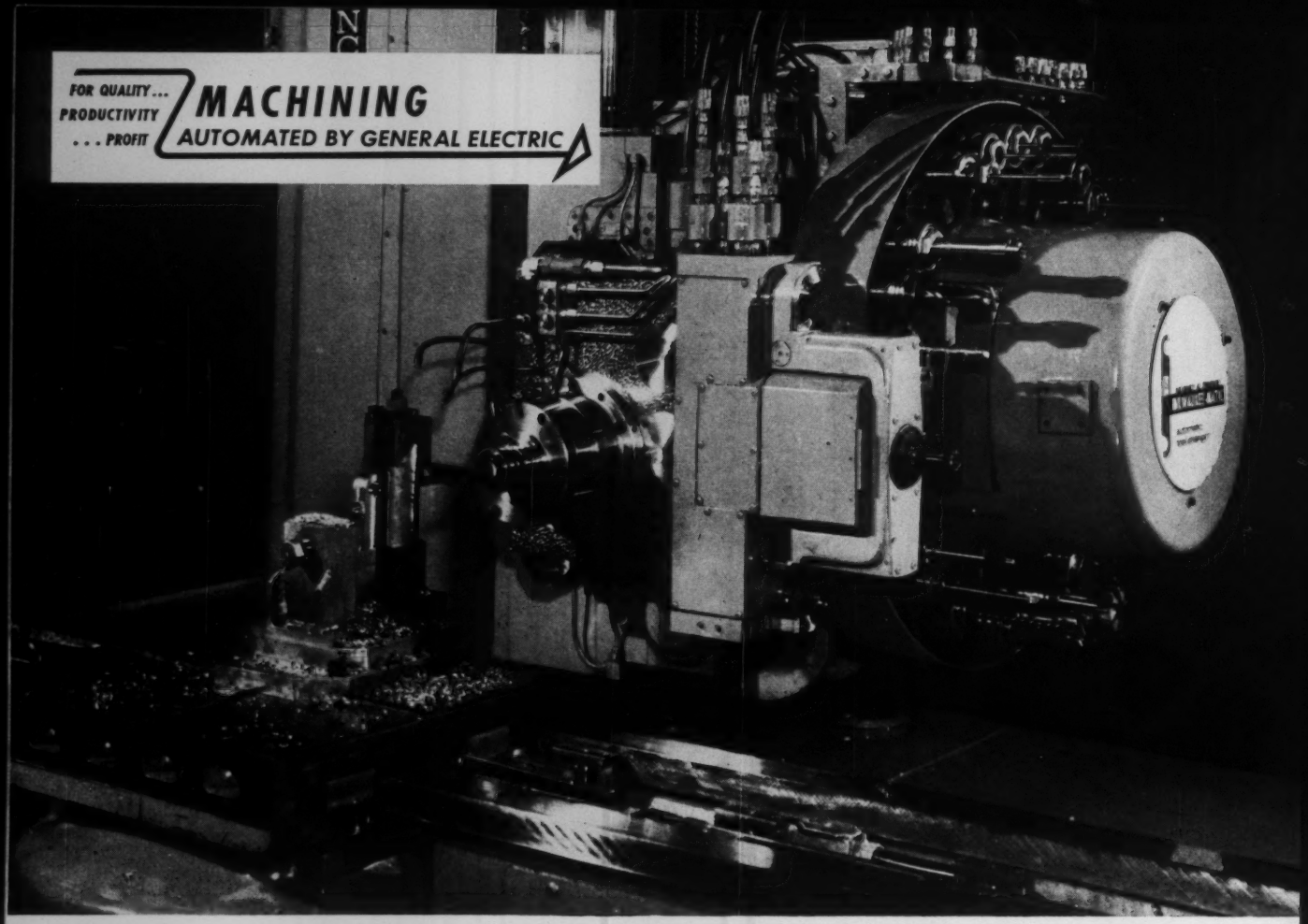

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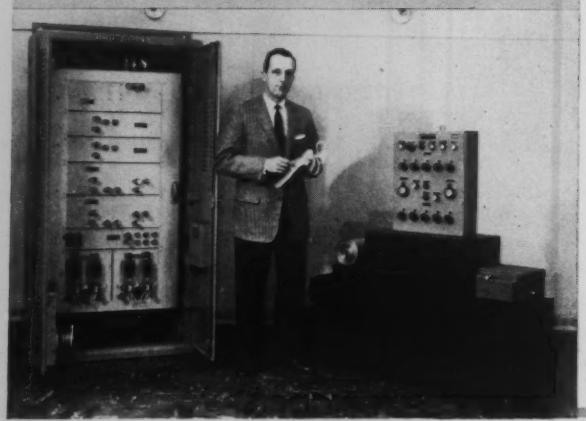

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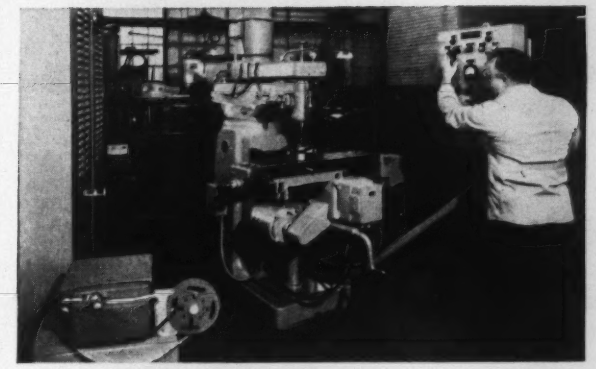

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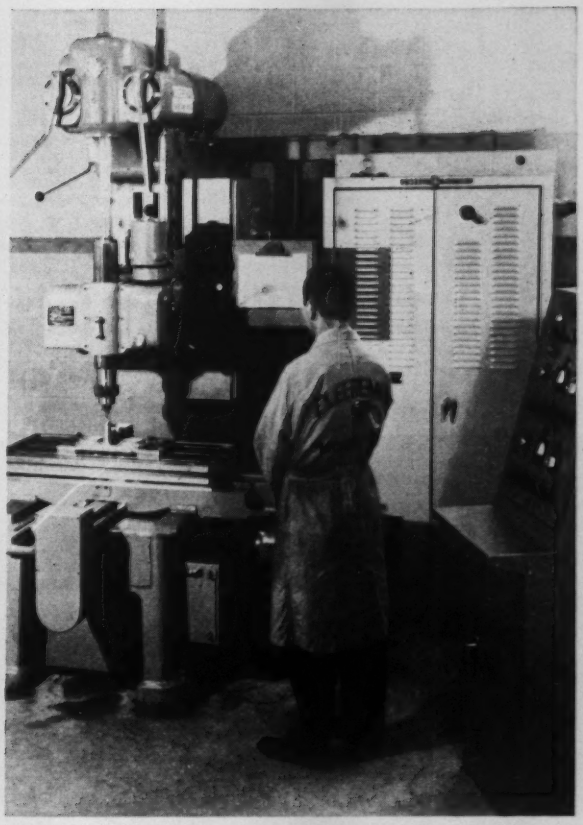

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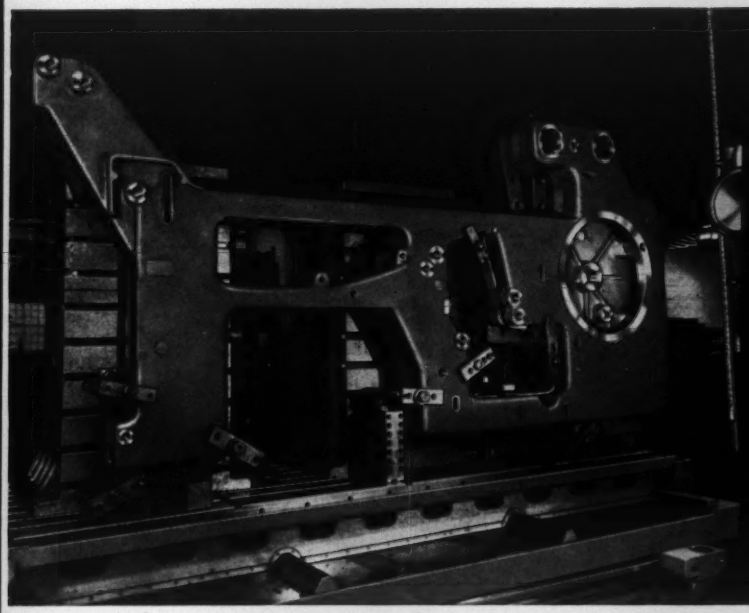

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- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

A TYPICAL EXAMPLE OF JIGMIL VERSATILITY

AMF uses the JIGMIL Technique for machining a multitude of components for their cigarette making machines, bread-wrapping machines, automatic pin setters, cigar making machines and many others. Illustrated is a pair of bread-wrapper side frames set against angle blocks on a Model 4B-96 SPIRAMATIC JIGMIL. All boring and side milling operations were done on the JIGMIL in one setup. Previous time on conventional boring and milling machines was 10 hours per part. Time on the JIGMIL is 3 hours per part.

The Glenn L. Martin Co.
Michigan Tool Co.
North American Aviation, Inc.
Northrop Aircraft, Inc.
Otis Elevator Co.
Pratt & Whitney Aircraft Division, United Aircraft Corp.
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Thompson Products, Inc.
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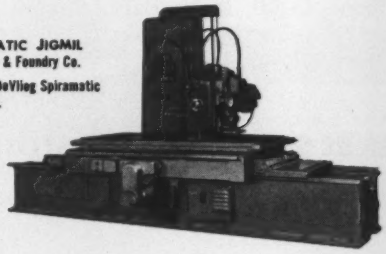
WILL YOU BE THE NEXT TO VISIT FAIR STREET



Model 4B-96 SPIRAMATIC JIGMIL as used by American Machine & Foundry Co.

For complete information on DeVlieg Spiramatic Jigmils, send for new catalog.

DeVlieg

SPIRAMATIC JIGMILS®

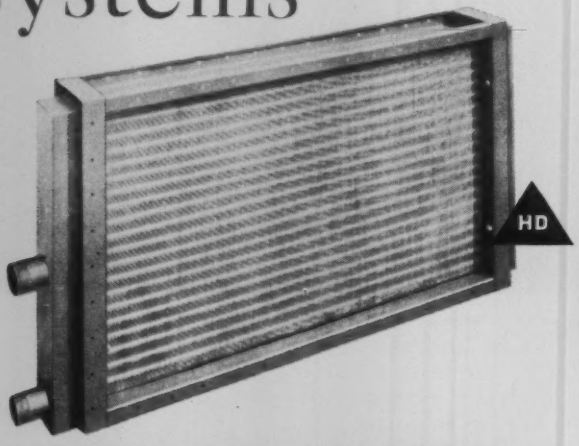
ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

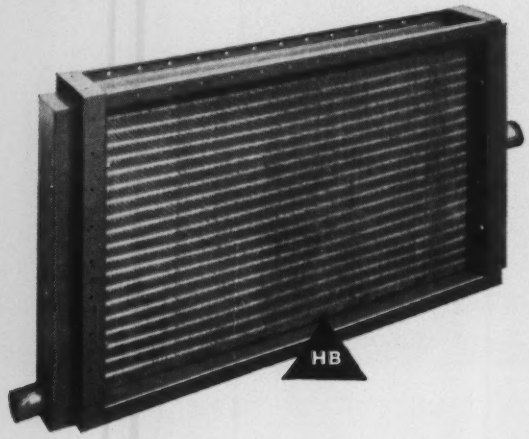
Here's your complete guide to steam heating coils in fan systems

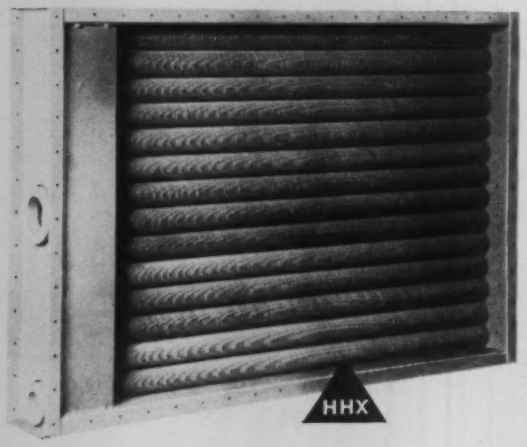
Blast Heating Coils for most general purpose heating, ventilating and air conditioning. Copper tube and aluminum or copper fin construction for steam pressures up to 200 psi. Available in face areas from 1.88 to 29.17 sq. ft., standard, medium and low temperature rises.

Steam Distributing Tube Coils also used in heating, ventilating and air conditioning systems. Each tube is fed from an inner perforated supply tube providing uniform steam distribution when throttling. Ideal where input air is at freezing temperature. Sizes and performances identical with Blast Heating Coils.

Heavy Duty Coils built with finned tough wrought iron pipe to resist internal and external corrosion in continuous duty high pressure systems and industrial processes—*exclusive with Westinghouse*—face areas range from 3.33 to 29.10 sq. ft., steam pressures up to 200 psi.







Sturtevant Division fan system components include Air Handling, Air Cleaning and Heating & Cooling Products—all from a single source with a single warranty—*best* for service and satisfaction.

Call your Sturtevant Division Sales Engineer or write Westinghouse Electric Corporation, Dept. DI00, Hyde Park, Boston 36, Mass. *. . . Pioneers and pacesetters in air treatment for 100 years.*

YOU CAN BE SURE... IF IT'S Westinghouse

J-80700

Watch Westinghouse Desilu Playhouse on CBS Alternate Fridays.

TREADWELL COOLING BED

built in tandem, each over 100 ft. long. Each bed will cool 125 tons of 4" x 4" steel per hour.

For heavy duty and efficient production, this steel company called on Treadwell Engineers. The result . . . these Treadwell Cooling Beds are efficiently operating day in and day out.

If you have a machinery problem, call on Treadwell Engineers.

Pictured above: Treadwell Cooling Beds at work in an eastern steel mill.

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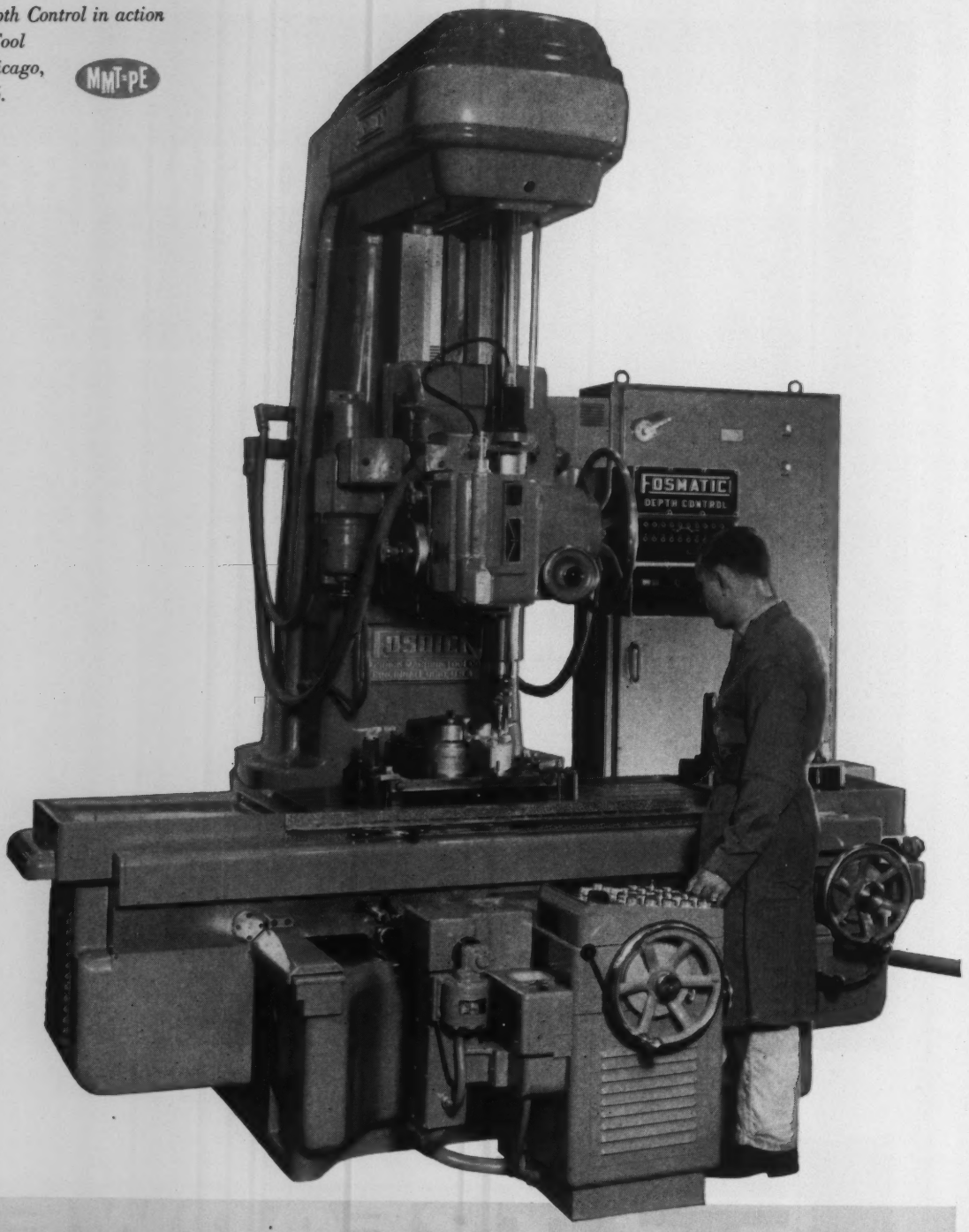
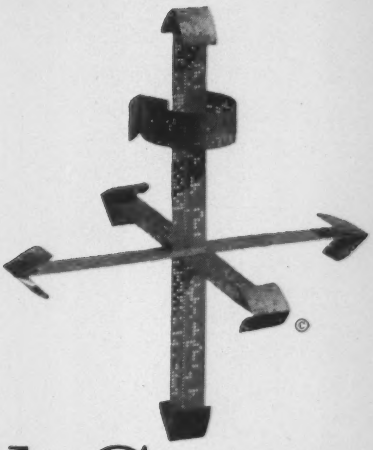
CASTINGS—Electric Furnace Steel, Ductile Iron, Gray Iron and Ni-Hard

See Fosmatic Depth Control in action at the Machine Tool Exposition in Chicago, September 6—16.

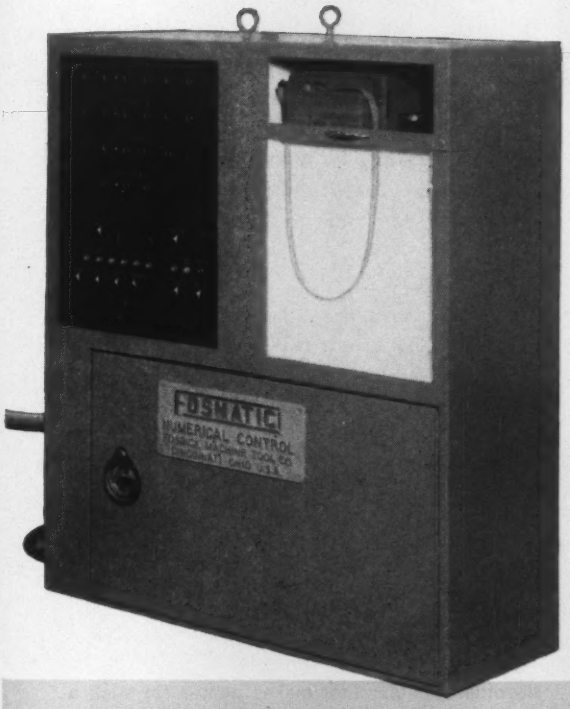
MMT·PE



PRECISION



Numerical Control
in three directions



DEPTH CONTROL developed by Fosdick, adds the ultimate *third dimension* to precision boring. Use random length tools for boring to depth under complete numerical control. Combine rapid depth control with horizontal positioning, preselected spindle speeds and feeds, coolant on-off, tool selection, even automatic tool changing, all by Fosmatic Numerical Control.

Tape or dial any depth. Absolutely no stops to preset.

Fosmatic Numerical Control easily fits into a cabinet small as your home refrigerator. The Fosdick system is electro-mechanical. Its electrical components are simple, easily maintained.

Always, with or without numerical control, you depend on a Fosmatic for precision within 0.0001".

Keep precision machining control in the front office. Relieve the operator of his "fear of error." Investigate—and invest—in lower costs with Fosmatic precision, now. Write for Catalog PB-A.

BORING FOSDICK

THE FOSDICK MACHINE TOOL COMPANY
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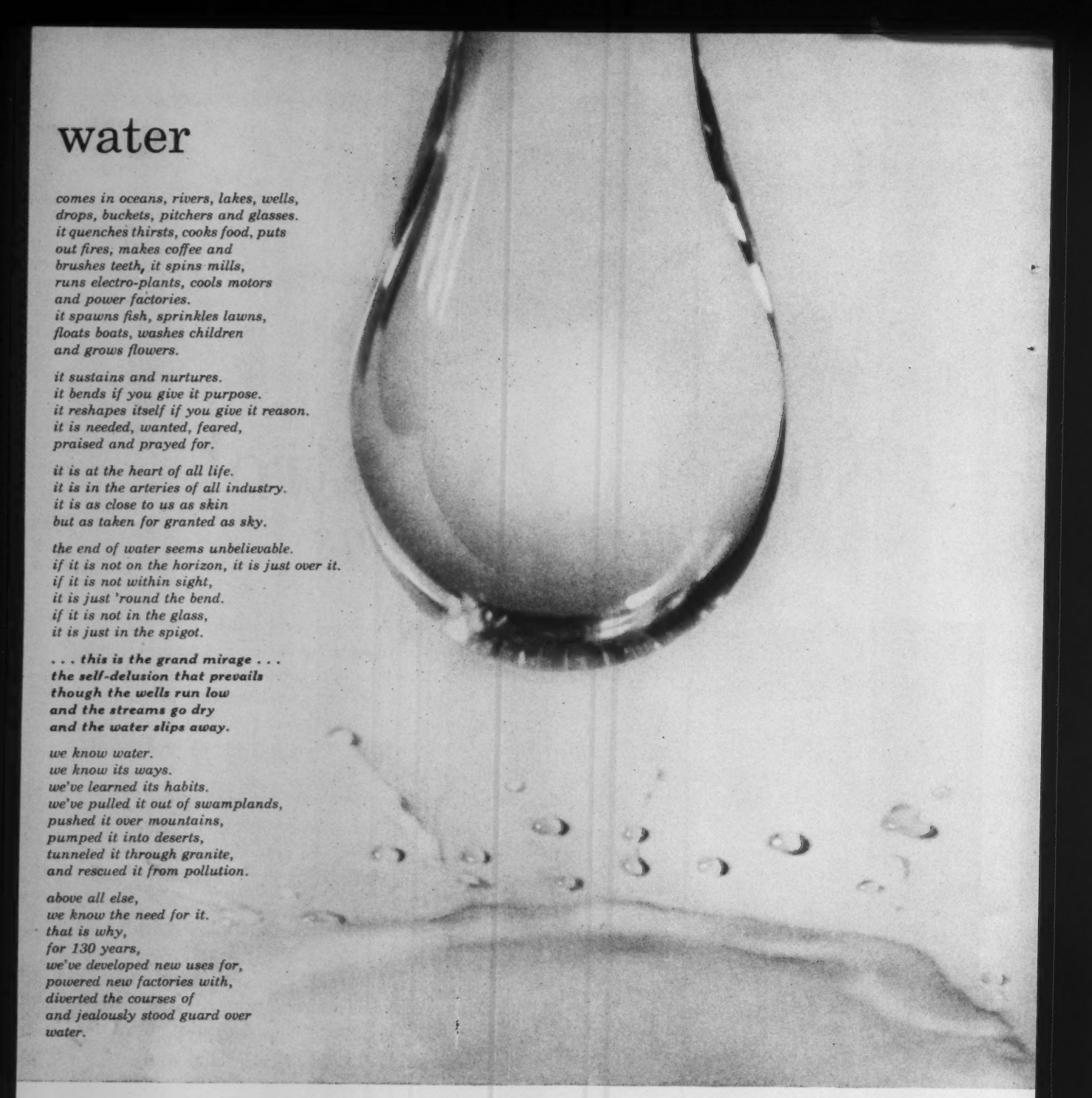

water

comes in oceans, rivers, lakes, wells,
drops, buckets, pitchers and glasses.
it quenches thirsts, cooks food, puts
out fires, makes coffee and
brushes teeth, it spins mills,
runs electro-plants, cools motors
and power factories.
it spawns fish, sprinkles lawns,
floats boats, washes children
and grows flowers.

it sustains and nurtures.
it bends if you give it purpose.
it reshapes itself if you give it reason.
it is needed, wanted, feared,
praised and prayed for.

it is at the heart of all life.
it is in the arteries of all industry.
it is as close to us as skin
but as taken for granted as sky.

the end of water seems unbelievable.
if it is not on the horizon, it is just over it.
if it is not within sight,
it is just 'round the bend.
if it is not in the glass,
it is just in the spigot.

. . . this is the grand mirage . . .
the self-delusion that prevails
though the wells run low
and the streams go dry
and the water slips away.

we know water.
we know its ways.
we've learned its habits.
we've pulled it out of swamplands,
pushed it over mountains,
pumped it into deserts,
tunneled it through granite,
and rescued it from pollution.

above all else,
we know the need for it.
that is why,
for 130 years,
we've developed new uses for,
powered new factories with,
diverted the courses of
and jealously stood guard over
water.

Fairbanks, Morse

A MAJOR INDUSTRIAL COMPONENT OF FAIRBANKS WHITNEY CORPORATION, NEW YORK

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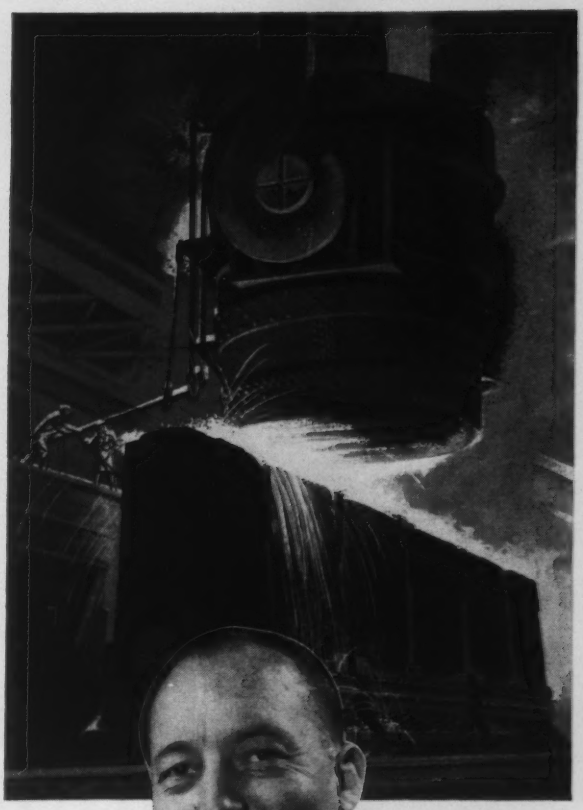
Our pumps . . . our generators and controls . . . our new rotary compressors . . . our drive toward better ways to de-salt ocean water . . . the potential of our advance Research & Development Center in Beloit . . . our lead position in the field of Hydrodynamics . . . all of these equip us to serve you.

Send for our brochure—"Hydrodynamics." Please write to Mr. Robert W. Kerr, President, Fairbanks, Morse & Company, 600 South Michigan Ave., Chicago 5, Illinois.

Soffel's Production Tested Thermotomic Sideboards increase

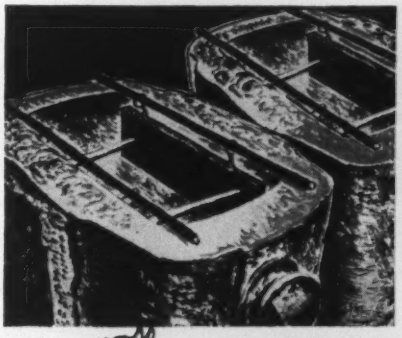
INGOT TO SHIPPING WEIGHT RATIO by 6 to 8% *Consistently*



Production tested on full heats up to 100 tons, Soffel's Thermotomic Sideboards are revolutionizing ingot yield percentages when used in the heads of big end-down slab molds. Metallurgical quality is maintained or improved in every case. One leading stainless producer verifies a conservative 6 to 8% increase in "out the door" products. Other leading producers report similar profitable results in carbon and other grades. Yet these exothermic Sideboards cost little more than ordinary hot tops which they eliminate.

We will be glad to design and engineer Thermotomic Sideboards to meet your pouring conditions, mold designs, etc., and to assist you in properly testing this new product in your plant soon.

Phone National 5-1571
for facts and figures — Today



Roy E. Ferree, developer of Thermotomic Sideboards, shows how easily they are handled.

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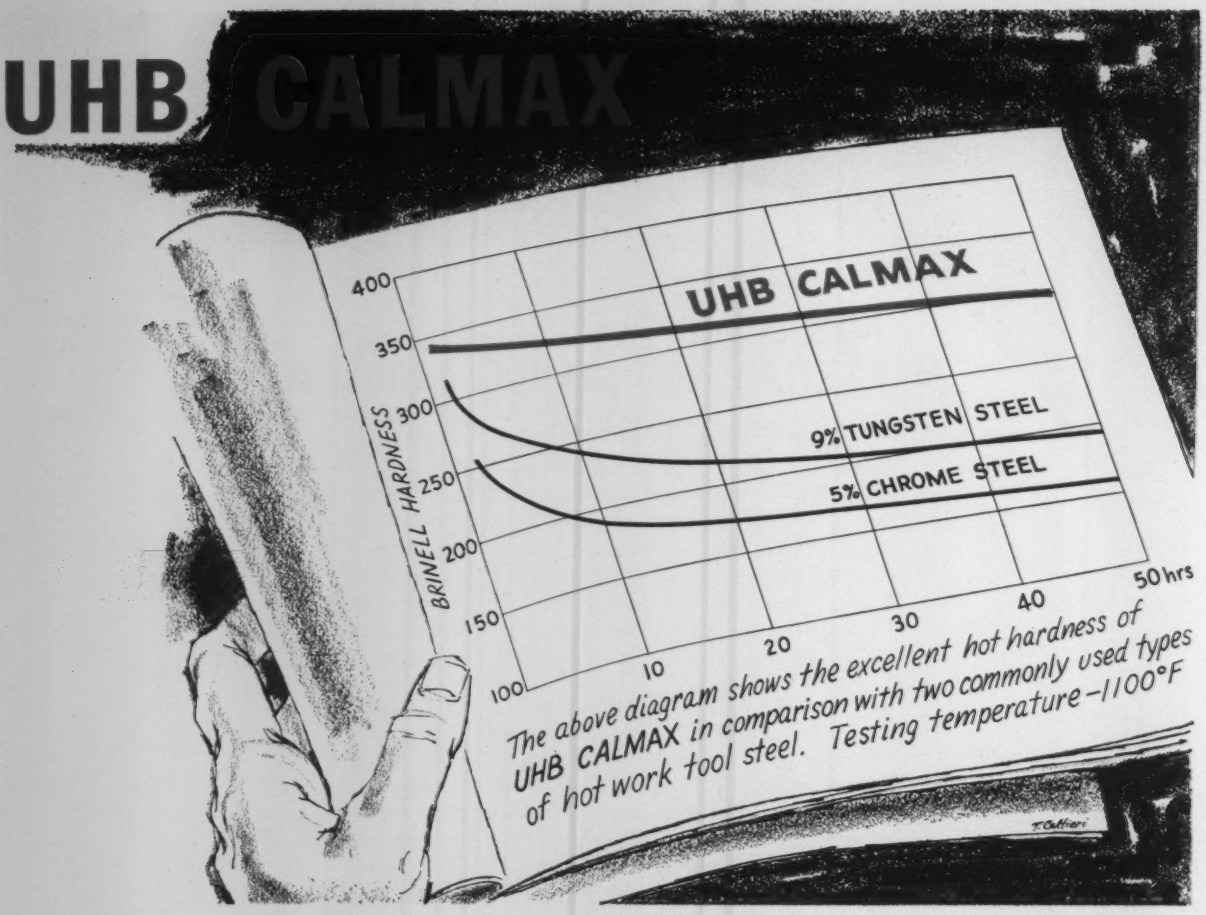

A New HOT WORK Steel For Your Most Severe Applications!

UHB CALMAX is the latest Uddeholm development to meet your highest demands for hardness, wear resistance, mechanical strain and impact at elevated temperatures. It is a chromium-tungsten-cobalt steel and, when cooled in air, hardens through in all sizes. In years of testing by a major non-ferrous manufacturer, UHB CALMAX demonstrated extraordinary stand-up-ability to heat checking and wear. For hot press-forging, die casting, and extrusion of copper, copper alloys, and other materials with high melting points, UHB CALMAX outperformed 9% tungsten and similar grades of hot work steels by more than 3 to 1. In one instance, UHB CALMAX cores for die casting brass produced 15,500 parts, as opposed to 5000 with a 9% tungsten steel. The air hardening properties make heat treatment safe and easy. Distortion after heat treatment is insignificant!

If you need a steel that is simple to harden and that has a high hot-hardness, excellent resistance to wear and heat checking, contact your nearest Uddeholm office, today!

Ask For The UHB Calmax Pamphlet—See Uddeholm At Booth 548—A.S.T.E. Show

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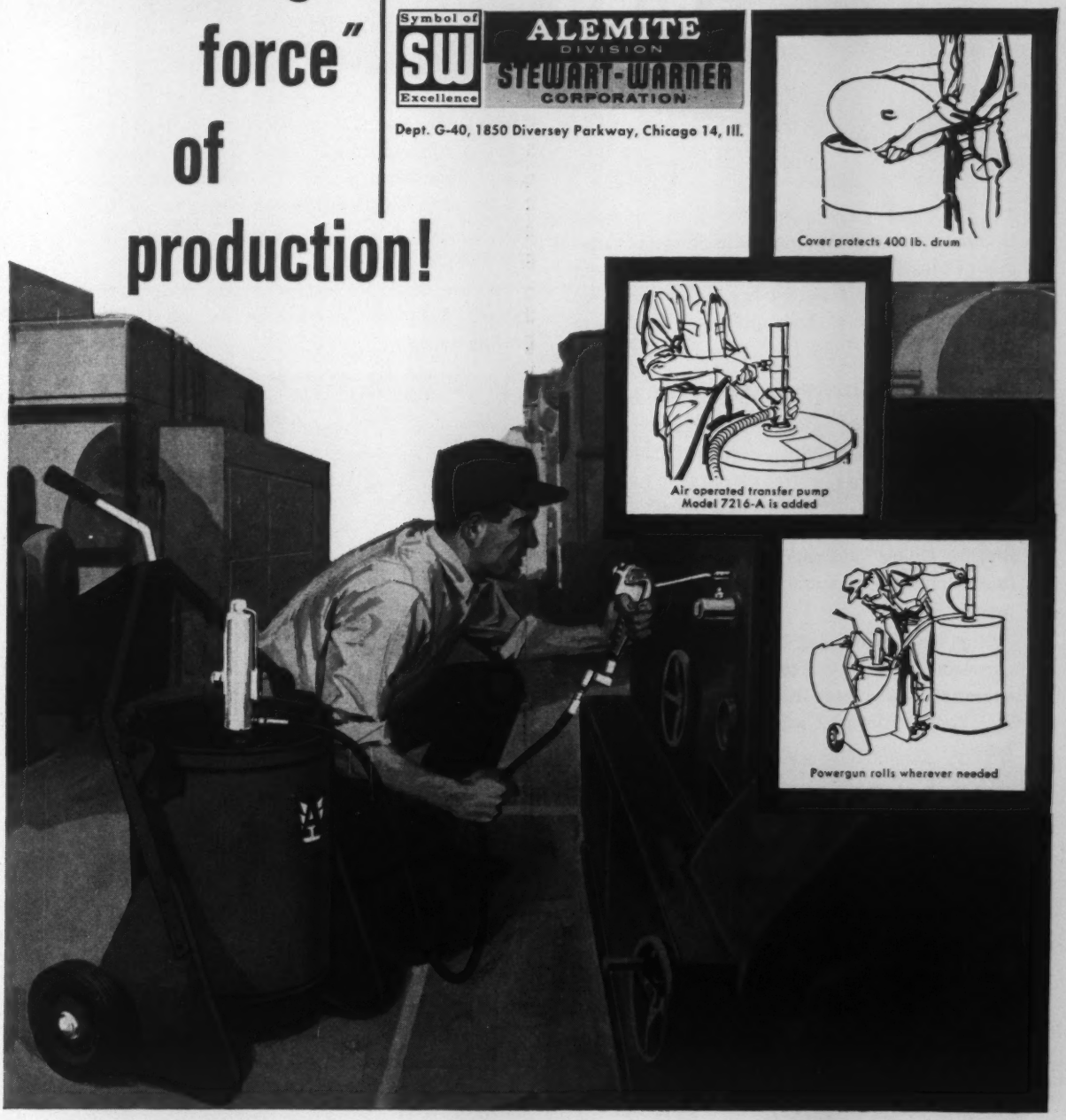

Cover protects 400 lb. drum

Air operated transfer pump Model 7216-A is added

Powergun rolls wherever needed

DODGE HAS MORE PROVED BEARINGS THAN YOU HAVE BEARING PROBLEMS!

It pays to buy from a line of stock bearings—bearings that have been proved in thousands of installations similar to yours. You benefit by getting known dependability; and you get the important savings of high quality at production price.

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Dodge has supplied mounted bearings to industry for over three-quarters of a century. Dodge bearings have always kept pace with improved production practices. Each new condition of service has been met by Dodge as it has arisen, with the result that the Dodge line contains mounted bearings to meet almost every service requirement with pin-point accuracy.

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BROAD LINE—WIDELY DISTRIBUTED

In the great variety of mounted bearings developed by Dodge, you will most likely find the precise unit to fit your requirements ideally—without paying for features you do not need. And if your requirements call for several types of bearings, there is an advantage in having them of common design, such as Dodge offers.

The Dodge line is probably broader than any other line of mounted bearings in America. And of special importance to machinery manufacturers, it is the most widely distributed line. There is always a Dodge bearing of the right type and size near at hand.

You can check this with your local Dodge Distributor. Ask him—or write us for the Dodge Bearing Bulletin.

In addition to tapered roller, spherical roller and ball bearings, Dodge builds many types of sleeve bearings. Here is the "large and small" of the sleeve type bearings carried in stock—ranging from an 8-in. Sleevoil weighing over 1200 lbs. to a ½-in. solid journal bearing weighing 9 ounces.

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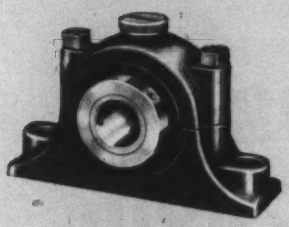
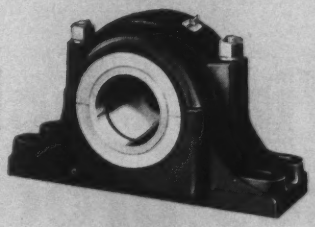
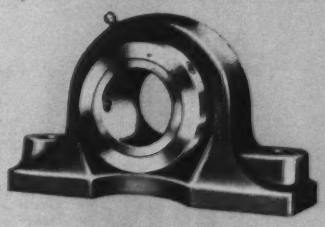


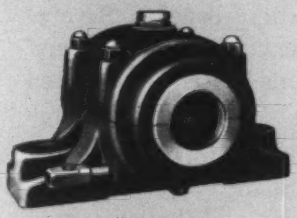
DODGE PILLOW BLOCKS WITH TIMKEN TAPERED ROLLER BEARINGS



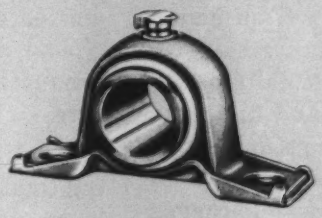
DODGE SPHER-ALIGN PILLOW BLOCKS WITH SPHERICAL ROLLER BEARINGS



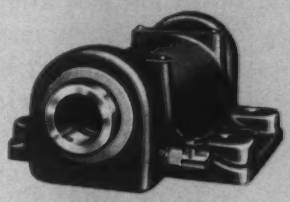
DODGE BALL BEARING PILLOW BLOCKS



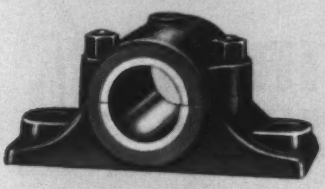
DODGE SLEEVOIL PILLOW BLOCKS



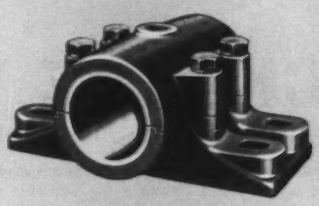
DODGE BRONZOIL PILLOW BLOCKS



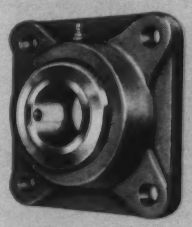
DODGE BRONZE BUSHED PILLOW BLOCKS



DODGE JOURNAL BEARINGS SOLID AND SPLIT



DODGE HEAVY RIGID PILLOW BLOCKS



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● **Dodge Sleevoil Pillow Blocks.** Ultra quality . . . extra long life . . . accessibility . . . *quiet*. Plain or water-cooled.

● **Dodge Bronzoil Pillow Blocks.** Efficient, low cost pillow blocks with self-oiling, capillary bronze bushings. Self-aligning. Large oil reservoirs.

● **Dodge Bronze Bushed Pillow Blocks.** Quiet fan and blower pillow blocks with two bronze bushings of high lead content mounted in one cast iron housing.

● **Dodge Journal Bearings — Solid and Split.** True running, dependable. Babbitted bearings with precision machined bores and faces. Finished bases.

● **Dodge Heavy Rigid Pillow Blocks.** Rugged, carefully bored, babbitted pillow blocks for many applications requiring grease lubrication. Finished bases and ends.

● **Bearing Units.** A wide variety—spherical seat, cartridge, flange, hanger, screw conveyor hanger, take-up. Ball, Roller and Sleeve types.

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DODGE

of Mishawaka, Ind.

Customer reports confirm...

CF&I Wire Packaging increases production, eases handling

In instance after instance, all across the country, manufacturers have reported cutting hours off daily downtime, easing storage and handling problems . . . *increasing production as much as 50%* . . . after they started using CF&I Steel Wire — Packaged for Your Production.

This is possible because all CF&I Wire is packaged specifically to give you one, or a number of special production or handling benefits. Several typical statements describing users' production benefits are reported here.

CF&I, the pioneer in wire packaging, makes wire in a wide range of gages and finishes. Whatever your needs, CF&I can fill them. Call your local CF&I sales office for full details on the Wire Packaged for Your Production.

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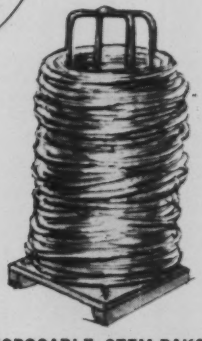

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Customer Report—
"50% increase in production since we started using Stem-Paks."

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Capacity—5-70 lbs.

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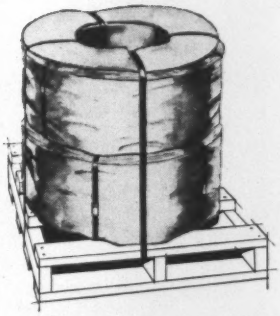
Capacity—250-600 lbs.

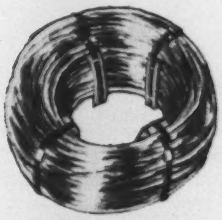
Customer Report—
"Wire protected from dust, rust and corrosive fumes. Easier handling, storage, inventory."

RETURNABLE SPIDERS: Capacity — 2000-3000 lbs. Customer Report — "25% increase in production, 20% less downtime and 80% less scrap loss with the long, uninterrupted pay-off of these returnable spiders." CF&I produces top quality wire in thousands of different types, sizes, shapes and finishes to meet all types of wire applications.



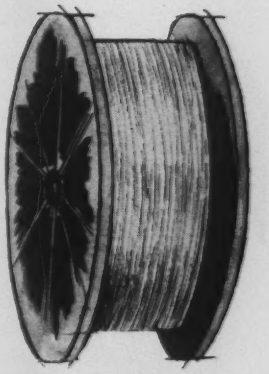
REEL-LESS CORES
Capacity—800-1000 lbs.

Customer Report—
"Easier handling, less storage problems and lower freight handling charges."



SHAPED COILS
Capacity—1500-2500 lbs.

Customer Report—
"20% increased production with longer runs, plus easier storage and reduced handling costs."



RETURNABLE STEEL REELS
Capacity—500-800 lbs.

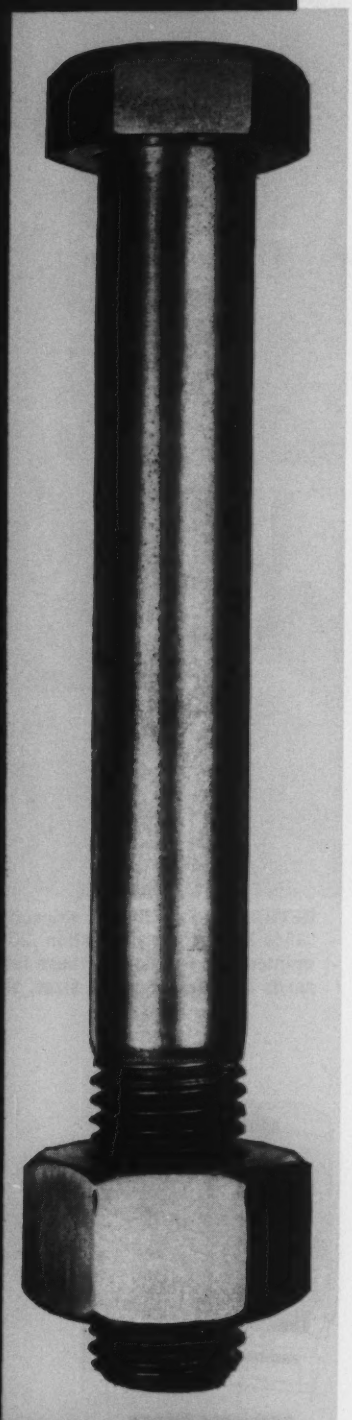
Customer Report—
"Holds six times the wire as standard coils. Smoother pay-off, less scrap loss, easier shipping."

WATERBURY FARREL
MACHINERY BUILDERS

BUILDS A WIDE RANGE OF

COLD HEADING MACHINERY*

for high speed, scrapless forming of metal parts



*includes: cold headers (single or double blow) progressive headers, nut formers, parts formers, thread rollers, slotters, trimmers, and pointers; also special purpose headers and auxiliary equipment

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
Waterbury, Connecticut, U.S.A.

Sales Offices: Chicago • Cleveland • Los Angeles • Millburn, N. J.

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

4 good reasons why you should use IRIDITE®

Chromate Conversion Coatings

ON YOUR ZINC OR CADMIUM PRODUCTS

CORROSION PROTECTION

The wide range of Iridite coatings available gives you a choice of corrosion protection—from economical, mild protection of parts for shipment, storage or display, to extremely high protection under exposure to marine and highly humid atmospheres, gasoline or other hydrocarbons.

PAINT BASE

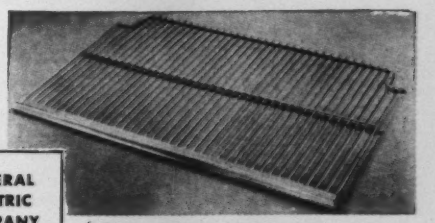
For an extremely tight bond for either baked or air-dried paints, non-porous Iridite blocks moisture penetration—prevents formation of metallic soap products beneath paint coatings.

APPEARANCE

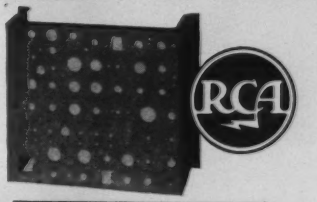
Your choice of colors ranging from clear through yellow iridescent to olive drab. Bright Iridite finishes can also be dyed to provide other color effects.

SPECIAL EFFECTS

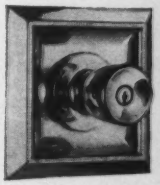
Iridite, in combination with other Allied Research processes, can provide a wide variety of finishes. As an example, Iridite 8-P applied to zinc or cadmium, followed by an application of Irilac, gives a highly attractive simulated brass finish.



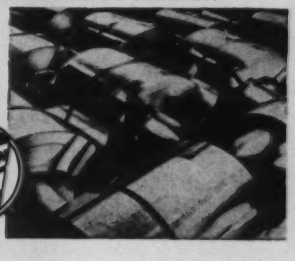
GENERAL ELECTRIC COMPANY



RCA



Medalist
NATIONAL LOCK COMPANY



WEIRTON STEEL COMPANY

IRIDITE—a specialized line of chromate conversion coatings for nonferrous metals. Easily applied at room temperatures with short immersion times, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel. Special equipment, exhaust systems or highly trained personnel not required.

For complete information on Iridite, contact your Allied Field Engineer. He's listed in the yellow pages under "Plating Supplies." Or, write for FREE TECHNICAL DATA FILES.

Allied Research Products, Inc.

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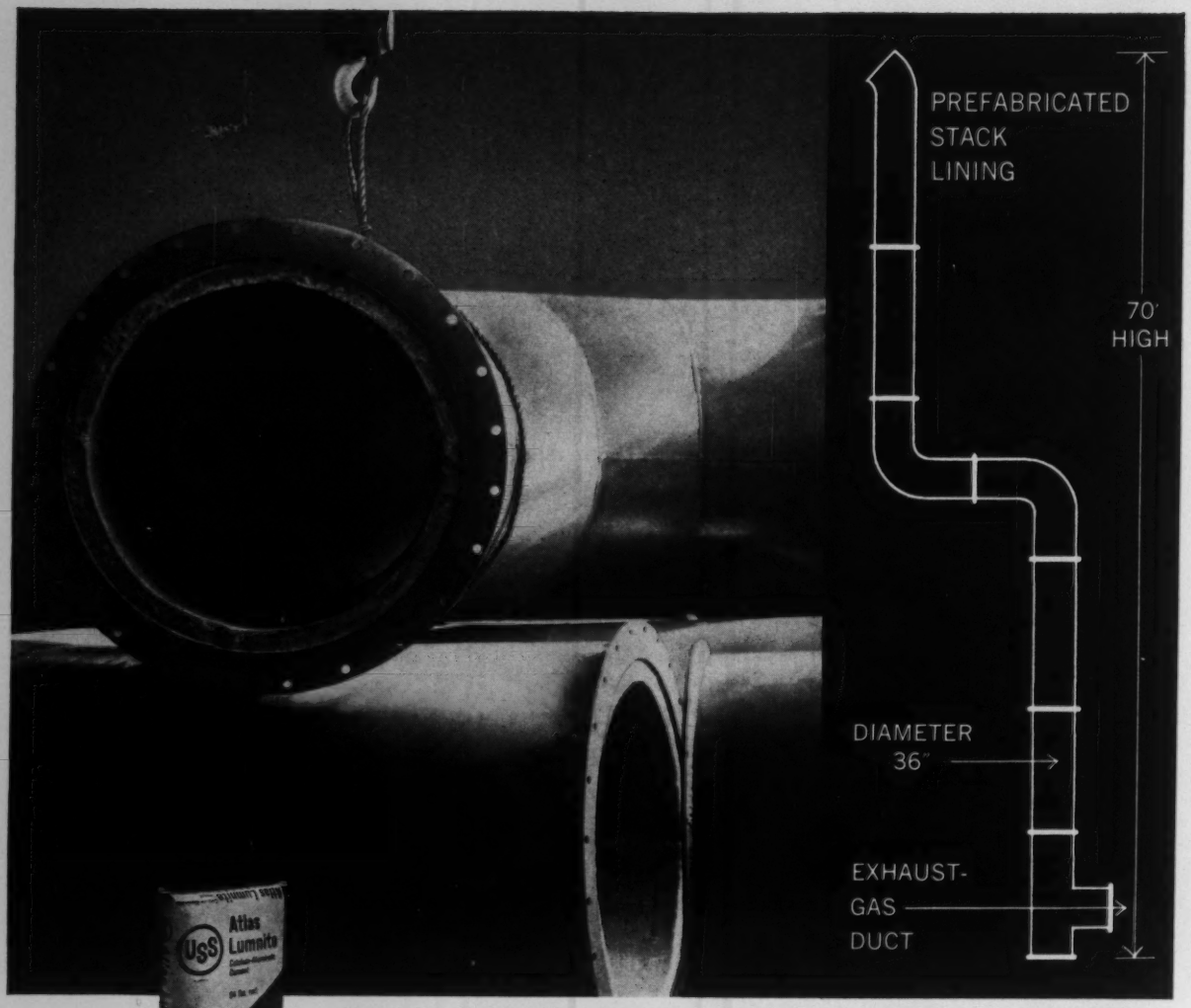
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electrochemical Processes, Anodes, Rectifiers Equipment, and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment



Castable-lined prefab sections of waste-gas ducts and stacks for pit annealers at United States Steel's Homestead (Pa.) Works. **Contractor:** Amsler Morton Company, Pittsburgh, Pa.

Castable lining in prefab stacks reduces costs

When unusual stack and duct layouts are necessary, prefab elbows, tees, dog-legs and straights can be pre-lined with a refractory insulating concrete at considerable savings. Using a castable refractory, bonded with LUMNITE calcium-aluminate cement, monolithic linings can be cast in place without anchors or reinforcing mesh. Since the concrete will reach service strength in 24 hours, early release and re-use of forms are possible, speeding the job. Compared to cutting and fitting small refractory units, there is less material loss. Cluttered job sites and scaffolding are eliminated. And casting indoors means no delays due to weather. Leading manufacturers of refractories offer castables bonded with LUMNITE cement for a variety of installations in metalworking. Castables are packaged mixtures, ready to use. Simply add water, mix and place. For details, write Universal Atlas Cement, 100 Park Avenue, New York 17, N. Y.

L-202

"USS," "Atlas" and "Lumnite" are registered trademarks

Universal Atlas Cement
Division of
United States Steel

Offices: Albany · Birmingham · Boston · Chicago · Dayton · Kansas City · Milwaukee · Minneapolis · New York · Philadelphia · Pittsburgh · St. Louis · Waco

You'll be riding high with fast-moving Olin Aluminum

Automakers are riding high with aluminum grilles and trim—and from Olin Aluminum come finishes ranging from satin sheen to sunburst brilliance.

Boatmakers enjoy smooth sailing with tough, corrosion-resistant alloys of Olin Aluminum—creating lissome pleasure craft that stay on the water and off the saw horses.

Commercial trailer and mobile home makers find that Olin Aluminum delivers the goods: extrusions and alloys of consummate color consistency and rugged strength.

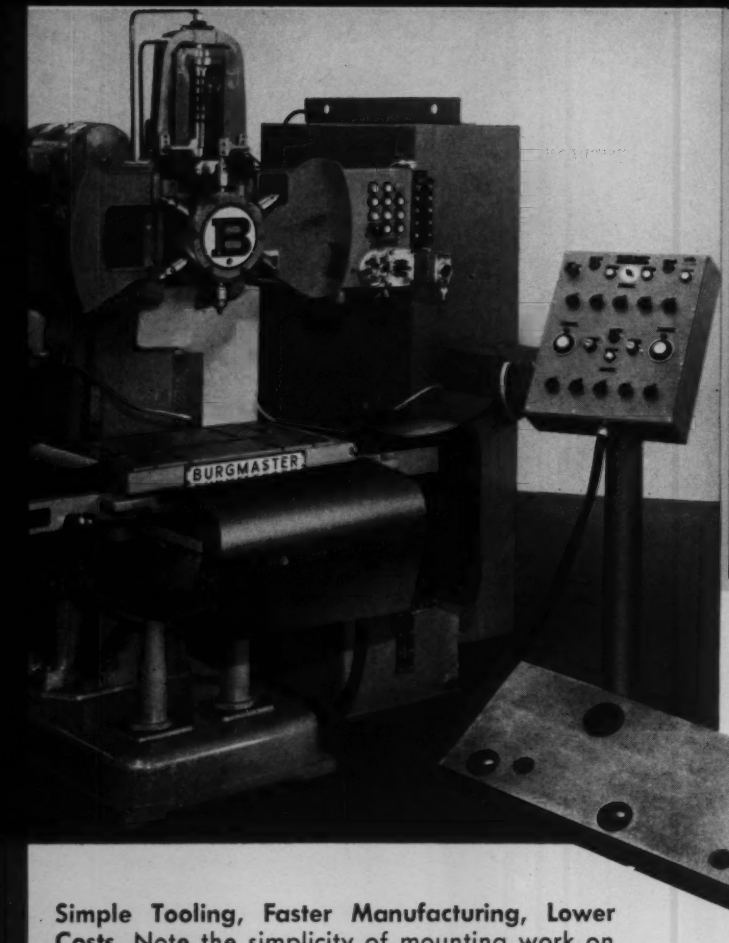
Whatever you make, you get primary aluminum and mill products in the alloys and finishes you need, along with the most attentive service in the business, when you work with your local Olin Aluminum representative or distributor. Check the Yellow Pages. Offices in principal cities.

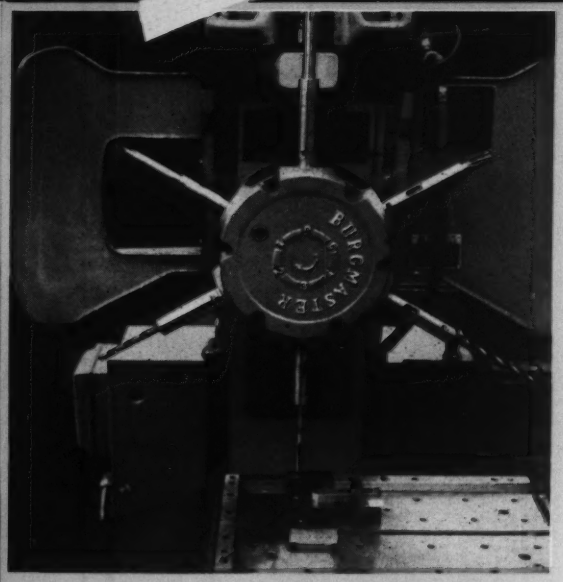
OLIN ALUMINUM®

OLIN MATHIESON • METALS DIVISION • 400 PARK AVENUE • NEW YORK 22, NEW YORK

Layout Eliminated, Faster Mfg.,

BURGMASTER *tape controlled*





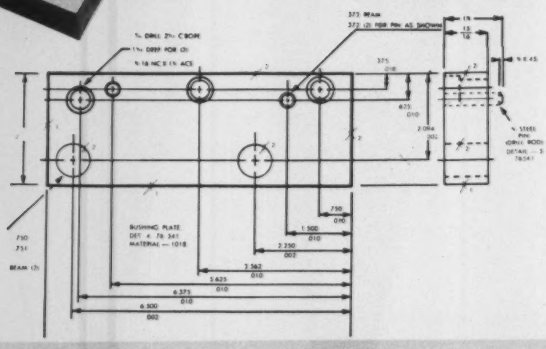
This steel drill plate involving drilling 7 holes, c'boring 3 holes, boring and reaming 4 holes was taped in 35 minutes and machined in 31 minutes to tolerances of ±.002". Note the simple set-up.

The Machine Tool Exposition
Booth No. 301— Amphitheatre

1960 MMT-PE

Simple Tooling, Faster Manufacturing, Lower Costs. Note the simplicity of mounting work on the table for performing a multiplicity of machining operations of ±.002". In a short time approximately 1000 tapes have been made. Tapes are tooling stored for future use — and when parts are repeated — **savings snowball.**

Note proper method for dimensioning drawing to facilitate tape making. Tapes are standard 1" wide, 8 hole, punched on a Flexowriter typewriter.



World's Largest Builder of Turret Drilling Machines

"0" Manual Power Index ¼" Capacity

1C Manual Power Index ⅜" Capacity

2B Manual Power Index ¾" Capacity

2BR Ram Type Radial Drill ¾" Capacity

2BH Automatic Hydraulic ¾" Capacity

3BH Automatic Hydraulic 1½" Capacity

25AH Automatic Tape Controlled 1¼" Capacity

2BHT-3BHT Automatic Tape Controlled ¾" and 1½" Capacity

Less Fitting on Small Lots with...

TURRET DRILLING MACHINE

(at The Ingersoll Milling Machine Co., Rockford, Illinois)

Savings in a number of important indirect ways are made at the Ingersoll Milling Machine Company, Manufacturers of Special Machine Tools, with their Burgmaster Tape Controlled 6 Spindle Turret Drilling, Tapping and Boring Machine. Most of their work comes in single pieces or small lot quantities, which would rarely justify drill jigs or fixtures. Tape Controls are assisting in solving their problems as follows:

- Hand layout is eliminated.
- Improved accuracy reduces fitting.
- Important lead time savings are accomplished.
- The machine is more productive and results in manufacturing savings compared with previous equipment.
- Holes are accurately located.
- Holes are accurately machined because the machine is rigid.

Maximum Flexible Automation

The standard adjustable Burgmaster controls permit the machine to be quickly set up from one job to another. These include pre-selective spindle speeds, infinitely variable pre-selective feeds, selective rapid approach and return, skip indexing, depth control, and simple manual controls for set up.

The G. E. numerical system controls all machine functions, selects spindles in any sequence, automatically positions the table on two axis, clamps the table while machining operations are performed, and controls coolant. Up to 6 or 8 different operations can be performed at any command position without moving the table, or as many cycles using one tool as desired, without indexing. All operations are carried out at their most efficient rate for high finish, precision, speed, and longest tool life.

Savings in tooling and many other indirect ways will quickly pay for a Tape Controlled Burgmaster. Get the facts on your work—there is no obligation.

JOB FACTS

Machine:	Burgmaster 6 Spindle Tape Controlled Turret Drilling, Boring and Tapping Machine.
Company:	The Ingersoll Milling Machine Company, Rockford, Illinois.
Part:	Drill Bushing Plate
Lot Size:	One
Holding:	Simple Clamp — located in corner strips.
Operations:	Drill 7 holes, C'bore 3 holes, Ream 4 holes.
Material:	1018 Steel — 1 13/16" thick.
Tolerance:	Hole Location ±.002" Reamed Hole —.001 +.000
Former Method:	Hand layout for drill 9 minutes Drill and c'bore 9 minutes Bore & ream 4 holes 66 minutes 84 minutes total
Former Machine:	Box column vertical single spindle drilling machine and precision jig boring and milling machine.
Present Method:	Punch tape for Burgmaster 35 minutes (5 mins. per hole) Drill, c'bore and ream 31 minutes 66 minutes total
Time Savings:	18 minutes first time, next run 53 minutes as tape is now in stock.
Other Advantages:	Indirect Savings: layout eliminated, faster manufacturing, improved accuracy, less fitting, less trucking, faster repair service, direct machine time savings.

Write for Bulletin describing Burgmaster 6 and 8 Spindle Tape Controlled Turret Drilling, Tapping and Boring Machines. Thirty-minute 16mm sound film showing all Burgmaster Turret Drills in operation is available from any office without charge.

BURG TOOL

MANUFACTURING COMPANY, INC.

15001 South Figueroa Street, Gardena, California

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Plus dealer representatives in other industrial centers.

NEW K165...

It's different than any other KENNAMETAL* CUTTING GRADE

TYPICAL PERFORMANCE OF KENNAMETAL K165

Work Material	Operation	Tool	Depth of Cut	Speed sfm	Feed ipr	Performance
Arma Steel 88M, 32 RC	Finish facing 50 rms max. finish	KSBL-16C SPG-422	.021"	775	.0024	77 pieces per index with 20-30 rms finish. Best performance other tool material: 20 pieces per index with 40-60 rms finish.
AISI 308 Stainless Steel Tubing	Finish turn tracer lathe	KTGR-20C with TPG-433	.020" to .093"	950	.010	Negligible tool wear. 50 rms finish. .0001" loss of size in 41" cut. Old tool material: .030" flank wear, unacceptable finish, and .005" loss of size.
Cast Iron	Finish turning	Special TNG-321	.020"	1260	.009	Best performance of any other cutting materials evaluated.
M2 HSS Forging	Finish turning	KSFR-16 SNG-422	.100"	585	.016	11 pieces produced with less than .005" wear land. Previous tool material: 6 pieces at considerably lower machining conditions.
304 Stainless Steel	Precision boring	Precision boring tools	.0075"	1500	.003	6 holes, 5" deep, resulted in only .0002" loss of size and a surface finish of 10 rms.
Tricent Cylinder Case, 44.3" dia. x 23" long, 46 RC	Finish turn	KTDR-16C TPG-322	.005"	480	.007	40-60 rms finish. No measurable taper or tool wear. Previous tool material: extreme difficulty in obtaining 125 rms finish; unacceptable taper required additional passes and severe steps.

Engineered for the new era in machining

- For high velocity precision machining.
- Exceptional high hardness-strength for machining high temperature alloys of low machinability.
- Possesses greater combined crater and edge-wear resistance than conventional tungsten carbide cutting tool materials.
- Produces surface finishes as low as 12 rms and better . . . frequently eliminates expensive grinding operations.
- Maintains greater accuracy . . . reduces "loss of size" due to greater resistance to edge wear.

Complete details available

April 21
at 1960 ASTE Show

BOOTH 1004

KENNAMETAL *Inc.*

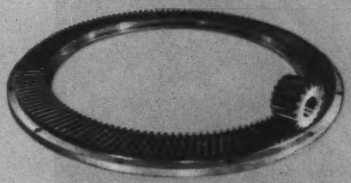
LATROBE, PENNSYLVANIA

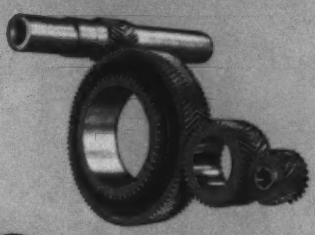
*Trademark

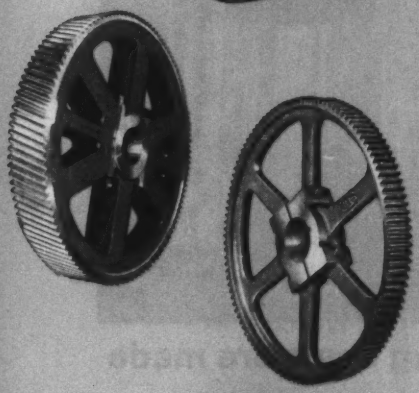
97287

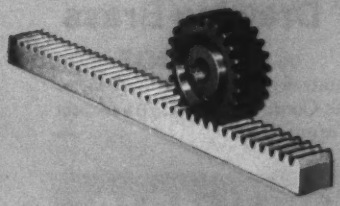
The Stamp of Final Approval on ILLINOIS GEARS

ILLG









International SYMBOL of QUALITY

This symbol of quality on ILLINOIS GEARS has earned extraordinary confidence on the part of gear users throughout the world. It is emblematic of the high standards of precision and quality that characterize every step in the manufacture of ILLINOIS GEARS.

In fact, so painstaking is this control of quality that each and every gear must pass a great many exacting inspections before it has earned the right to carry this stamp of final approval...your assurance of the *very finest gears in the world!* In the unmatched facilities of ILLINOIS GEAR one machine out of every six...and one man out of every ten are devoted to quality control.

If you are not now using or specifying ILLINOIS GEARS we invite you to profit from this rich heritage of quality that has established a new concept in gear manufacture.

Look for this mark ILLG® ***the symbol on finer gears***

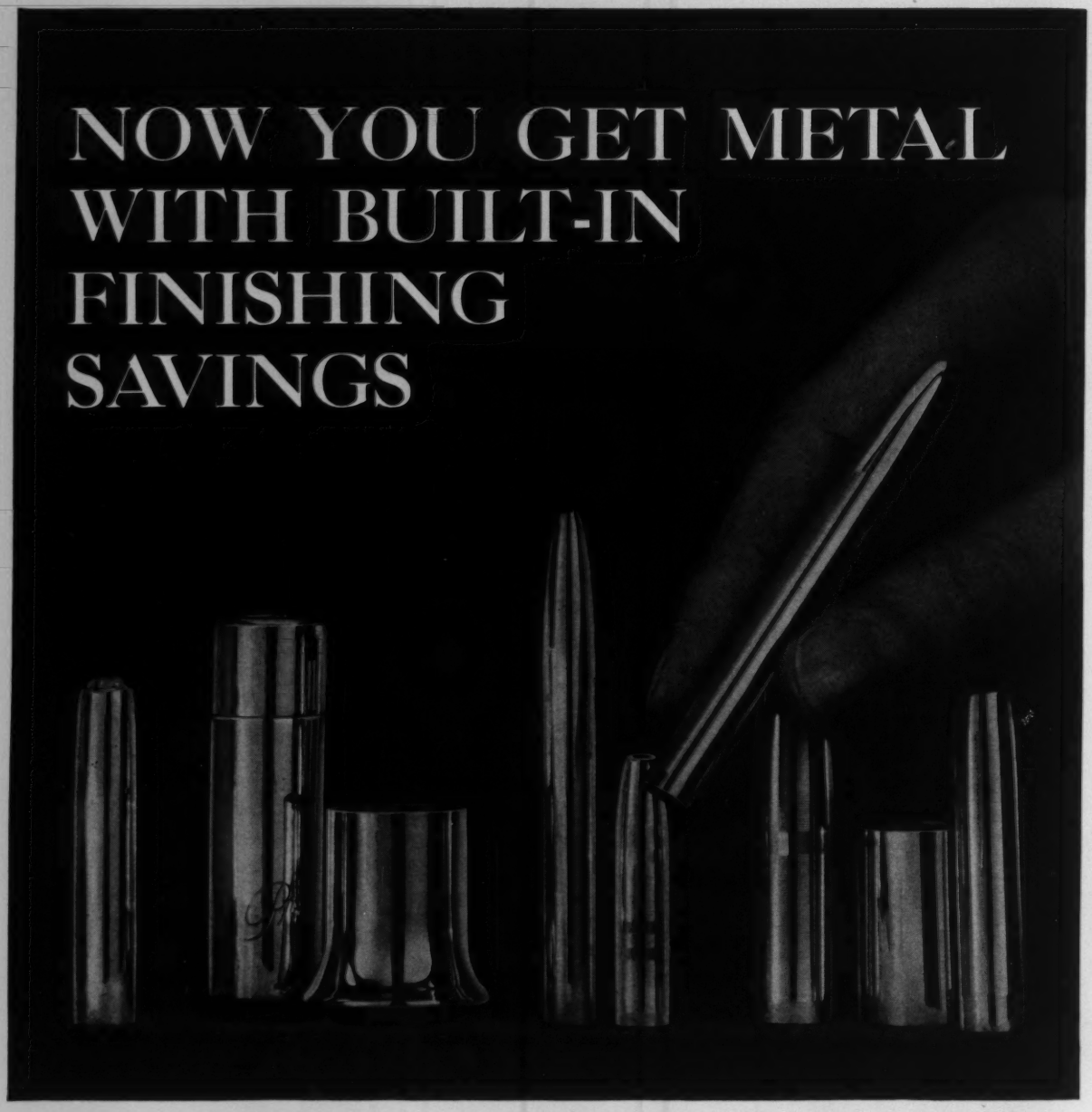
ILLINOIS GEARS Reg. U.S. Pat. Off.

Gears for Every Purpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

2108 NORTH NATCHEZ AVENUE • CHICAGO 35, ILLINOIS

NOW YOU GET METAL WITH BUILT-IN FINISHING SAVINGS



Faster production and up to 40% cut in polishing costs are made possible by superfine-grain structure of Formbrite® Drawing Brass

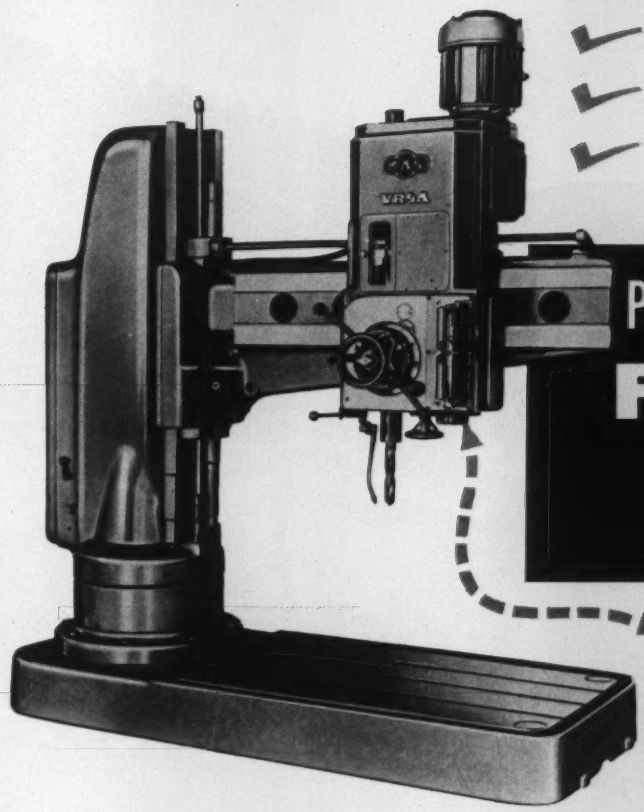
The jeweler's finish which Accurate Forming Corp., Franklin, N. J., gives pen caps and barrels previously meant the use of five polishing heads and a time bottleneck in production—resulting in a high polishing "cost factor." After switching to Red Brass-Formbrite, they use two polishing heads for a light cut and another for a simple color buff and run the machines faster. Savings run up to 40%. The secret of Formbrite is its superfine grain, produced by special rolling and annealing techniques. Formbrite is springier, harder, more scratch-resistant than the usual drawing brasses in the same standard tempers, yet retains remarkable ductility for forming and drawing. Despite its superiority, *Formbrite costs no more than ordinary drawing brass.* Get full details from your Anaconda representative or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. 6050

FORMBRITE

SUPERFINE-GRAIN DRAWING BRASS AN

ANACONDA®

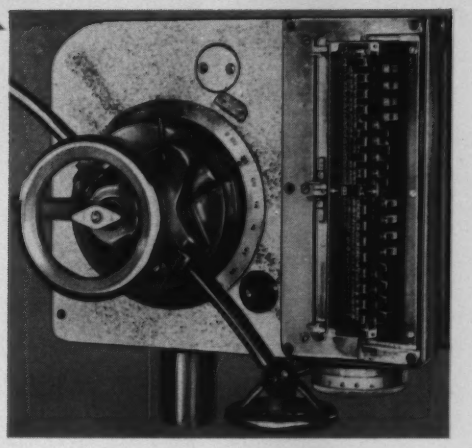
product made by The American Brass Company



- Faster Drilling
- Lower Cost
- Higher Profits

with this new, inexpensive

Program Controlled RADIAL DRILL



Automatic Push-Button Program Control. Up to 20 operations can be preset. The entire cycle is fully automatic. Each operation can have different spindle speeds, feed and hole depth.

see this new cost-cutting **RADIAL DRILL** at **BOOTH #1315** at **ASTME TOOL SHOW**

Other Profit-Making PRECISION MACHINE TOOLS on display, or in stock, for immediate delivery:

- Automatic Cycle Hydraulic Grinder
- Surface Grinder
- Centerless Grinder
- Tool and Cutter Grinder
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- Lathe with Hydraulic Tracer Control
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- Milling Machines
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For detailed specifications and prices write or phone:

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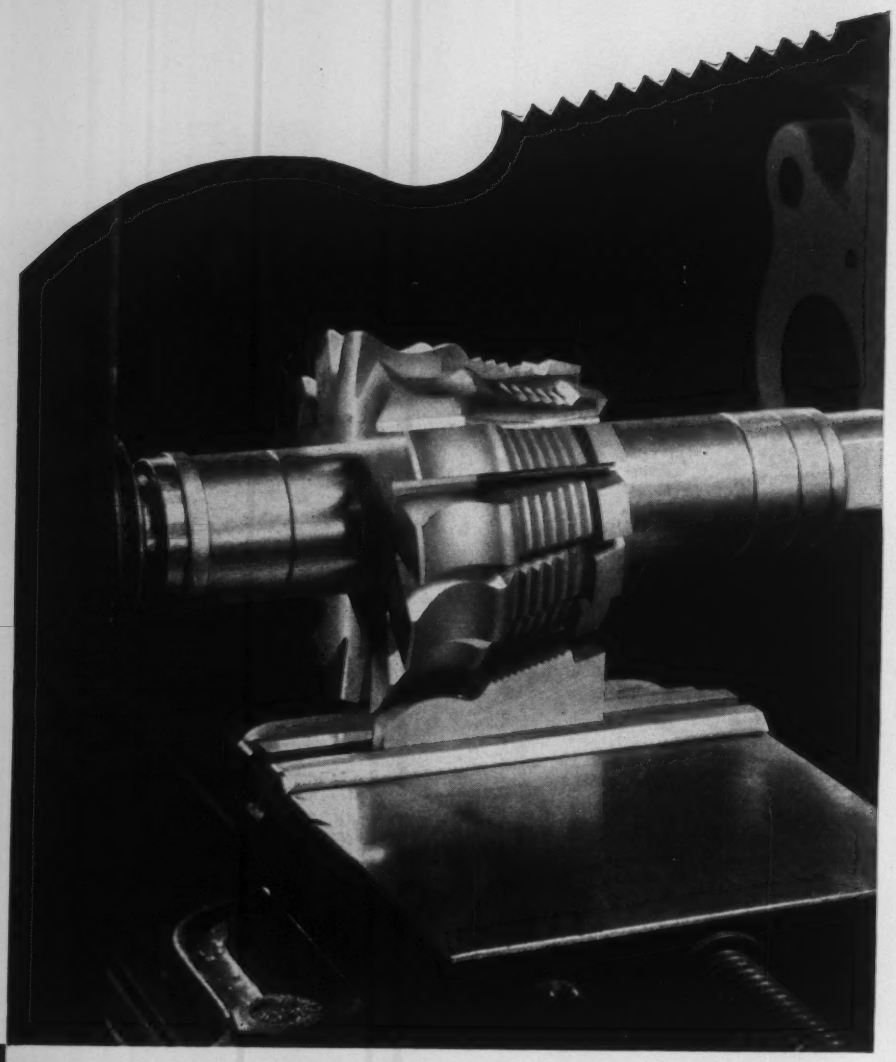


Cutters with built-in Efficiency and Accuracy

This is an example of how efficiency and accuracy can be designed right into the cutting tool. The manufacturing and engineering capabilities of Barber-Colman Company can be added to your own in finding better solutions to milling problems.

The form shown at the left of the part is milled at the same time the multiple serrations are cut. Milling sharp points on the serrations is made possible by the alternate tooth design (see photo, above). The cutter is shown milling a sample which is later projected against an enlarged layout of the part to assure that the cutter will produce within specified tolerances. But, some of the most important quality features of this cutter are not visible to the naked eye.

Unground form . . .

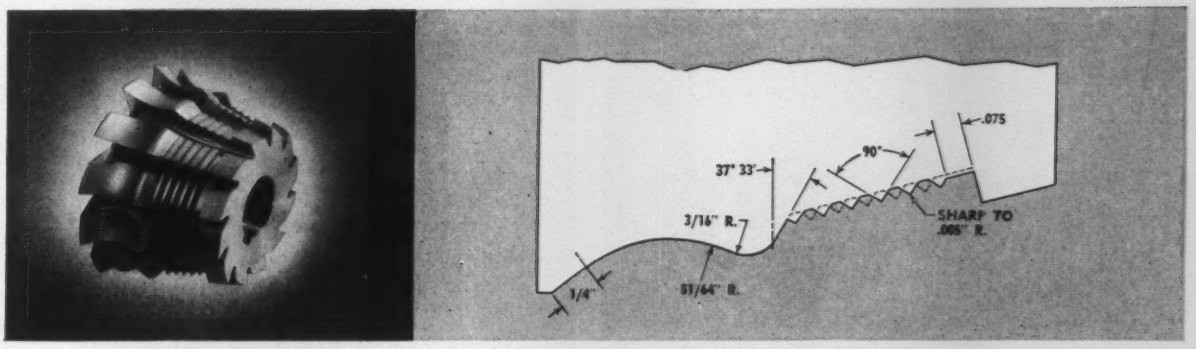
Ability to combine complex tool geometry and accuracy in this cutter without form grinding reduces original cost. In addition to greater accuracy, you get longer tool life from a cutter that is metallurgically as well as geometrically well formed. Barber-Colman's individual processing in the most modern metallurgical lab and heat-treating department assures highest quality which can be tested by the number of high-quality parts manufactured for every dollar of cost.

Sharpening economies . . .

Additional savings result from Barber-Colman's exclusive design and manufacturing techniques. For example,

Mill Odd Shapes in One Operation

...with Barber-Colman Form-Relieved Cutters



the smooth finish on the tops and sides of the teeth eliminates rough edges — a common cause of breakdown on the flanks. Faces are index-sharpened, permitting the important economy of *automatic resharpening.* Your sharpening guide or an automatic sharpener will maintain original accuracy throughout the life of the cutter.

These economies reduce the most important elements of tool cost: the cost of scrap and rework, cost of sharpening, cost of downtime for tool changes, and cost of tool depreciation.

Five types of engineering...

You get more than a cutting tool when you buy "Barber-Colman." You get five types of specialized engineering that reduce your costs and upgrade your quality:

1. *Application engineering* — on-the-spot evaluation of milling problems by experienced tool designers.
2. *Design engineering* — highly specialized tool engineering, backed by electronic computer facilities for fast, accurate calculation of complex forms.
3. *Metallurgical engineering* — specially selected steels and heat treatment for your particular material and tool geometry.
4. *Manufacturing* — the most complete and advanced processes under one roof for producing exactly the right finish, highest accuracy, and *any* cutter style.
5. *Quality control* — optical master inspection, seven different control stations, and numerous separate inspections for individual cutters.

Whether you want to combine operations, change processes, or just get more out of your tooling dollar, you can have a Barber-Colman field engineer at your desk for consultation by just calling Rockford — TR 7-5741.

Barber-Colman Company

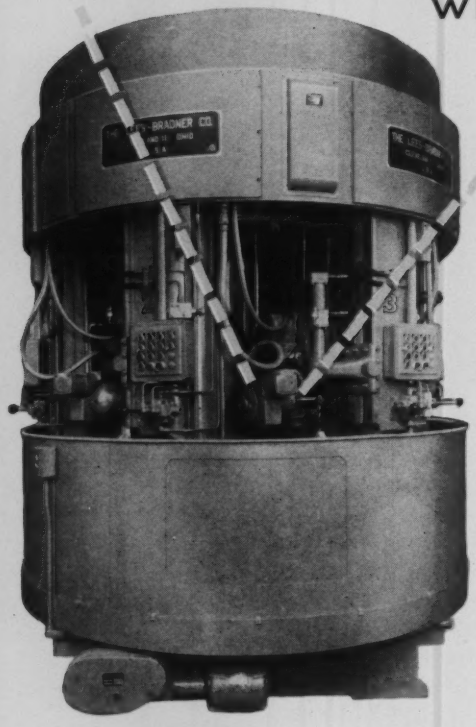
BARBER COLMAN

410 Loomis Street, Rockford, Illinois

3½ inch hob shift—
just Dial it!

YOU'RE WAY AHEAD...

with THIS HOB HEAD



LEES-BRADNER
7-HD 6-spindle hobbing machine
(Hevi-Duty)

...another FIRST from LEES-BRADNER!

Your business is to make money.

Our business is to help increase your production and lower your costs so you can make money!

The super-efficient hob head of the Lees-Bradner 7-HD line of modern hobbing machines makes them the most versatile, fast and accurate machines for gear cutting industry has ever known.

Put teeth in your future money-making, time-saving production plans! Step up to Lees-Bradner and cut down your gear hobbing costs.

Right now send for your 7-HD brochure and get the complete money-saving facts about the 7-HD hobbing machines—in single, 4 and 6-spindle models.

IMPROVING GEARS... FOR 50 YEARS!

the LEES-BRADNER *Company*
CLEVELAND 11, OHIO, U.S.A.

Spacious Shelbyville, Ind. plant allows complete assembly of large furnaces (left) and sub-assembly of major components for units too large to ship assembled.

HEAT
from General Electric

How General Electric saves you furnace assembly dollars . . . speeds start-up

From smallest lab furnaces to largest tower furnaces, gas or electric, you can save both time and money by having all or part of the assembly done in General Electric's Shelbyville, Indiana plant. G.E.'s spacious, modern factory has facilities to assemble the largest equipment which can be transported to the installation site.

Your savings are greatest if the entire furnace is assembled in the G-E factory. There's less interference with your operations; you hire less part-time labor; and your furnace is assembled by experienced specialists, directed by design engineers.

Even if your equipment is too large to ship assembled, you can still save by having major sub-assemblies fabricated in the G-E plant, then shipped to your site for final erection. Either way, General Electric provides supervision or complete installation at your plant.

Example: By having major sub-assemblies manufactured in the General Electric plant, an Eastern steel mill was able to start up a 100-foot long, 65-foot high G-E continuous furnace just over four months after construction began.

For fastest, most economical furnace installation, take full advantage of G.E.'s "added value" of factory assembly. Call your nearby General Electric Apparatus Sales Office. 721-33

GENERAL ELECTRIC

If what you make is round or square or odd shaped

If you make it one at a time or by the millions

If you want to check its OD or its ID or a whole

lot of dimensions at once ...and if you want

the gage to indicate a dimension or flash a light

or ring a bell or a machine on the basis of tolerances

down to thousandths .001 or millionths .000001

SHEFFIELD can recommend the exact type of

Air, Electric, Electronic, Visual or Limit gages you need...

or a complete automatic gaging or assembly machine or system...

with dimensional quality control based on the

ultimate standard of gagemaking: **INTEGRITY**

The

SHEFFIELD

Corporation *Dayton 1, Ohio*

A subsidiary of the Bendix Aviation Corporation

Gages, Measuring Instruments, Automatic Gaging & Assembly Systems • Machine Tools • Contract Mfg.

From a small furnace to a tall furnace Hevi-Duty helps you find the value solution to your heat treating problems

Each of the Hevi-Duty furnaces shown below delivers the value solution to a heat treating problem—the solution combining comprehensive design and industrial engineering with soundly built and tested equipment—the solution that pays off in increased production and extended economic life of equipment.

In each case, Hevi-Duty drew from its experience in solving thousands of industrial heat processing problems for all types of applications.

In each case, Hevi-Duty offered equipment from industry's most complete line of electric and fuel-fired furnaces and ovens. (Where stock designs or adaptions won't do, Hevi-Duty custom-engineers equipment—from laboratory furnaces to huge field-assembled furnaces.)

Case histories by the hundreds testify that it makes profitable sense to call in your Hevi-Duty sales engineer to help find the value solution to your heat treating problems.

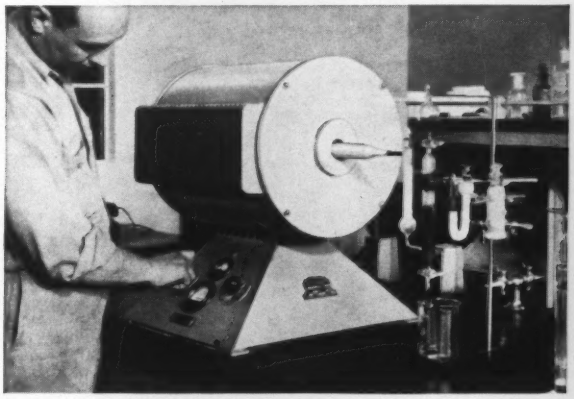
HEVI-DUTY

Electric and Fuel-Fired Industrial Furnaces and Ovens

B P C

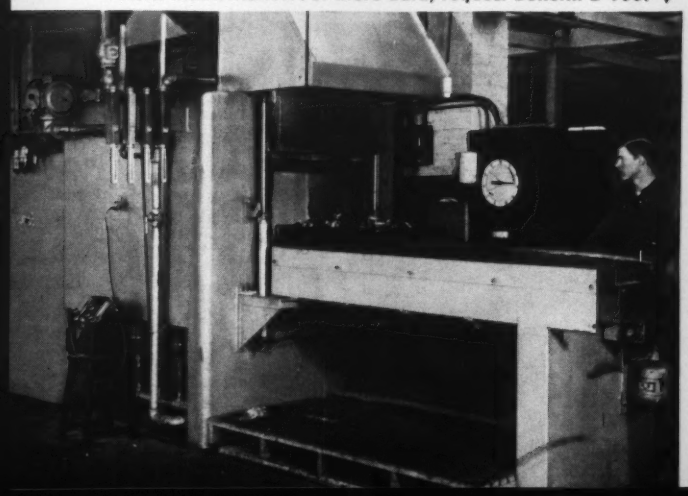
A Division of Basic Products Corporation

Hevi-Duty Electric Company, Milwaukee 1, Wis.

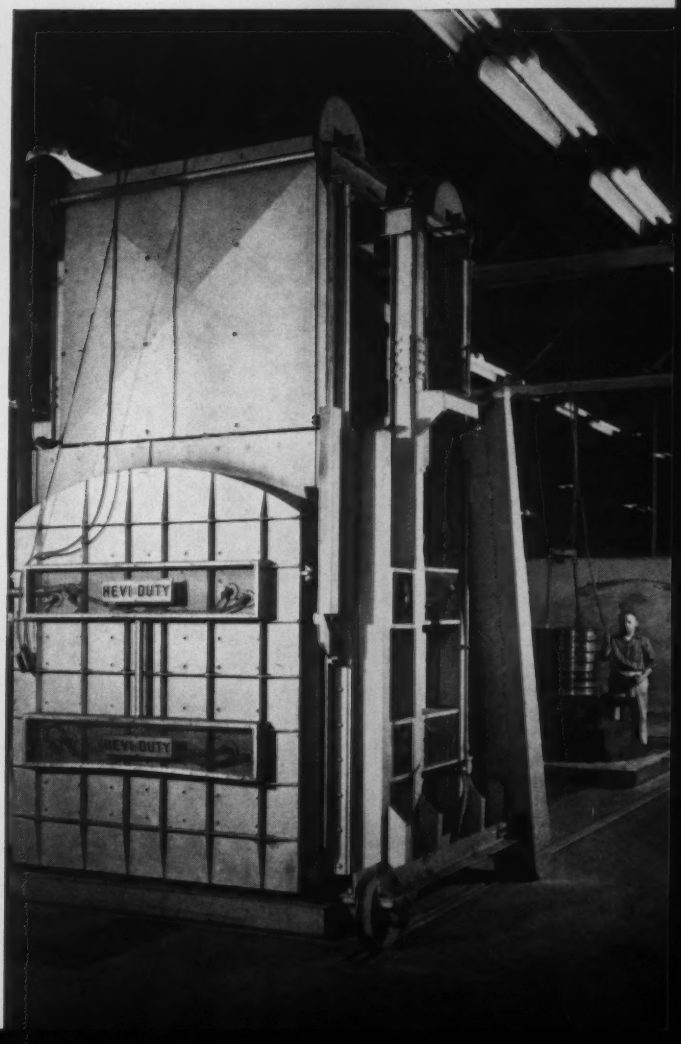


▲ *Merit Corp., Milwaukee, Wis., uses a Hevi-Duty tube furnace to maintain precise temperatures in laboratory quality tests on briquettes used by foundries as an additive to gray iron melts. Two-stage combustion operation on crushed sample burns off free carbon at 1679°F, total carbon at 2471°F.* **For more complete information, please write for Bulletin 254.**

Superior Metal Treating Corp., Muncie, Ind., uses two Hevi-Duty automatic Clean-Line furnaces 24 hours a day, 5 days a week for carburizing, carbonitriding and bright hardening. Temperatures range to 1925°F. The load-transfer mechanism is outside the heating chamber, reducing equipment maintenance. **For more data, request Bulletin D-100.** ▼



This Hevi-Duty traveling, double-end, box furnace provides ±10°F control at temperatures to 1850°F for bright tempering and stress relieving stainless steel jet engine weldments. This furnace is in continuous operation. User reports brightness improves during process. Unit provides bell-furnace mobility despite lack of head room. **Please write for Bulletin 653.** ▼



Now - exciting national

How to enjoy fun-filled leisure living
through Aluminum
Aluminum has a knack for making life easy and gracious. Inside and out, it works for you in dozens of ways to cut down chores and keep expensive maintenance to a minimum . . . to let you enjoy life more.
In a fascinating new booklet, offered here, you'll find exciting, new ways aluminum can help you take it easy. Thirty-six full-color pages show dozens of work-saving, time-saving, money-saving products brought to you by America's leading independent aluminum manufacturers.
Illustrated on these pages, are some of the products these skilled craftsmen make. To learn about more of these products . . . to find out new ways to cook . . . new ways to garden . . . new ways to make life more fun and less work – just fill out and mail the attached, postage-free card – or write direct to Aluminum Limited Sales, Inc., Box 409, New York 46, N. Y. Just ask for "Homeowner's Guide to Better Living." Your free 36-page, full-color booklet will be mailed promptly.
Aluminum Limited
FREE
FULL COLOR 36 PAGE BOOKLET
better living
Please mail me your 36 page, full-color booklet, "Home Owner's Guide to Better Living."
Name
Street and number
City
Zone
State

Look for this **new** 4-color ad in...

Saturday Evening Post April 16	30,000,000 readers
Better Homes & Gardens May	18,000,000 readers
The American Home May	12,000,000 readers
Total:	60,000,000 readers

Unusual tear-out coupon offers new aluminum products booklet

advertising that works for you!

New Spring promotion by Aluminium Limited sets its sights on 60,000,000 prospects for aluminum products—more than ⅔ of the nation's homeowners

Plus an exciting new 36-page booklet written and illustrated for your dealers or customers to use at the retail level

Read how you can tie in to both parts of the program

Here's sales help where it counts . . . right at the retail level . . . a campaign created to seek out the homeowners who have an immediate interest in the aluminum products made by you and your customers.

In big, full-color spread advertisements in THE SATURDAY EVENING POST . . . BETTER HOMES & GARDENS . . . and THE AMERICAN HOME the campaign features your fast-moving Spring items—aluminum building products.

Again—as in Aluminium's successful Fall promotion which drew over *one hundred thousand inquiries* from every part of the nation—there is an attractive booklet offer. This time a new 36-page booklet, "Homeowners Guide to Better Living . . . with Aluminum."

The booklet has been prepared for use by you or your customers at the consumer level. Written in interesting, editorial style—it's a sales tool you'll be proud to use. Dealers can use it for more effective, more personalized selling! As an attention getter! Door opener! Mailing piece! A professionally conceived promotion piece for give-away at the point of sale!

Send the coupon today! We'll send you information on how you can get personalized copies of the booklet. We will also send you the new Spring promotion kit that ties your dealers in to this national advertising aimed at two-thirds of your homeowner market.

SEND COUPON TODAY . . . FOR FACTS ON NEW BOOKLET OFFER AND NEW SPRING PROMOTION KIT

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, N. Y.

Gentlemen: Kindly tell me how I can get copies of your new 36-page booklet, "Homeowners Guide to Better Living . . . with Aluminum" along with a copy of the new Spring promotion kit.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

Aluminium Limited

ALCAN

In the U.S.—Aluminium Limited Sales, Inc.
630 Fifth Avenue, N.Y. 20, N.Y.

NEW YORK • CLEVELAND • CHICAGO • LOS ANGELES
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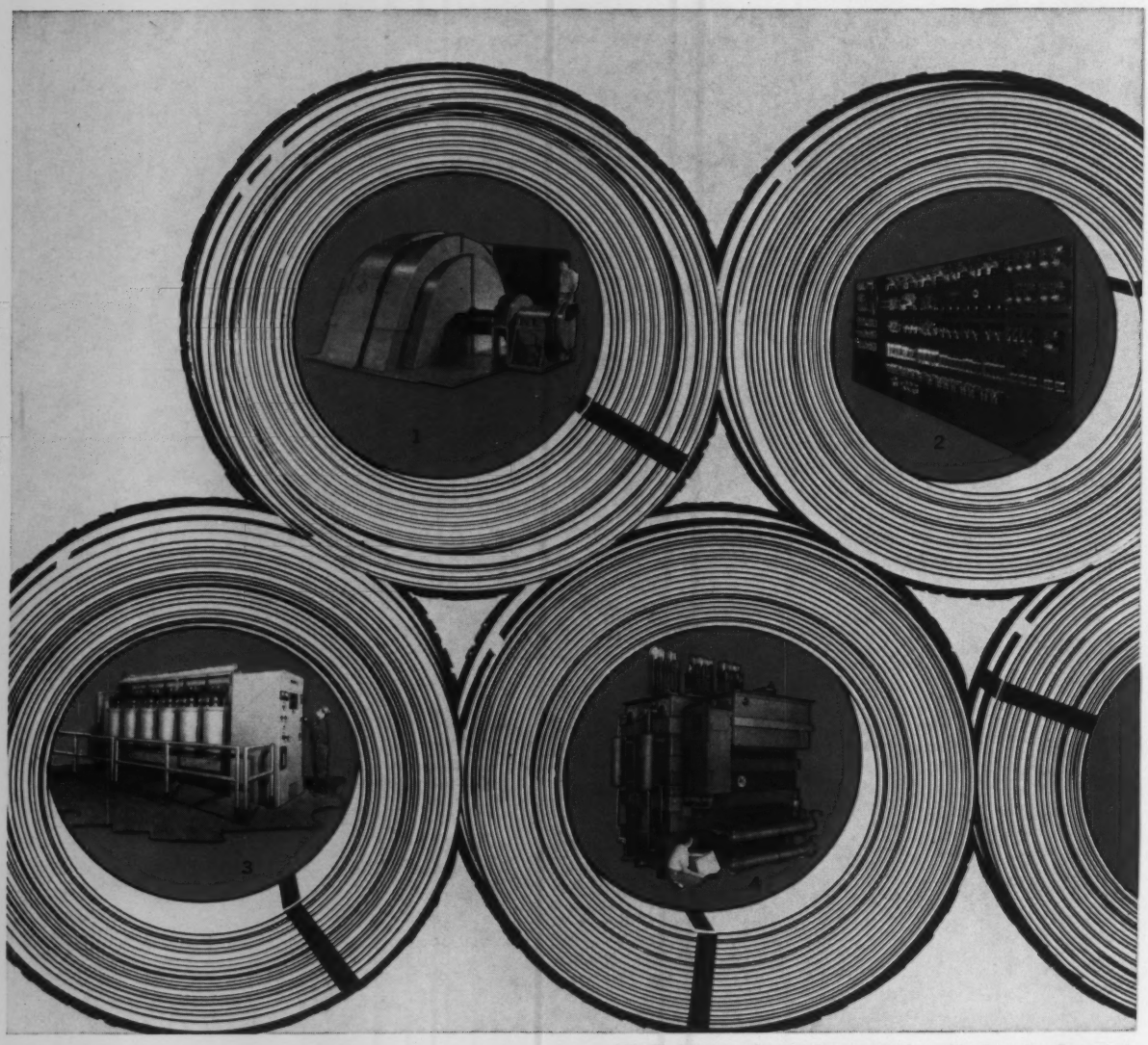
ALLIS-CHALMERS



Allis-Chalmers equipment for progressive mills: **1.** motor, **2.** control, **3.** mercury-arc and semi-conductor rectifiers, **4.** furnace transformers.

The right start for better end results

begins with Allis-Chalmers electrical equipment coordination

Proper application . . . efficient use of electric power — these are essential ingredients to peak mill output. No single piece of equipment in a process line can guarantee this result, for its performance depends on the accurate function of other devices.

Allis-Chalmers equipment is matched to mill standards for maximum performance. Blooming mills, hot-strip mills — wherever electric power is used, Allis-Chalmers coordinated engineering is the key to higher efficiencies . . . increased yield . . . a finished product of the highest quality.

Allis-Chalmers is helping steel mills with their new plant and modernization programs. Many have improved output and product quality without the cost of major plant alterations.

There's an Allis-Chalmers steel mill specialist near you. *Call him direct, or write* ***Allis-Chalmers,*** *Industrial Equipment Division, Milwaukee 1, Wis.* A-1272

NEW YORK
COLISEUM
JUNE 10-26

What have the British been doing in iron and steel?

(And in everything else?)

See their newest developments at the British Exhibition, June 10-26, at the New York Coliseum.

The past few years have been a period of spirited activity in British business, science and industry. New ideas, products and services are flourishing.

Now the best of these achievements will be displayed in a gigantic Exhibition in New York, under the patronage of Her Majesty Queen Elizabeth II and the President of the United States.

It will be a spectacle in the grand manner. (Nearly *twice* as big as the recent Russian show.) A vast number of British firms will show their newest, proudest wares. Executives of the exhibiting companies will be on hand to answer your questions—or talk business.

And the Exhibition will not lack its lighter side. You'll go sight-seeing in the London Arcade, see British films, quaff honest ale in a pub. The British like their fun.

Plan to come. You will find it an absorbing event and a profitable one.

U.S. Steel Supply gives improved sheet and strip service through Wean-equipped coil processing centers

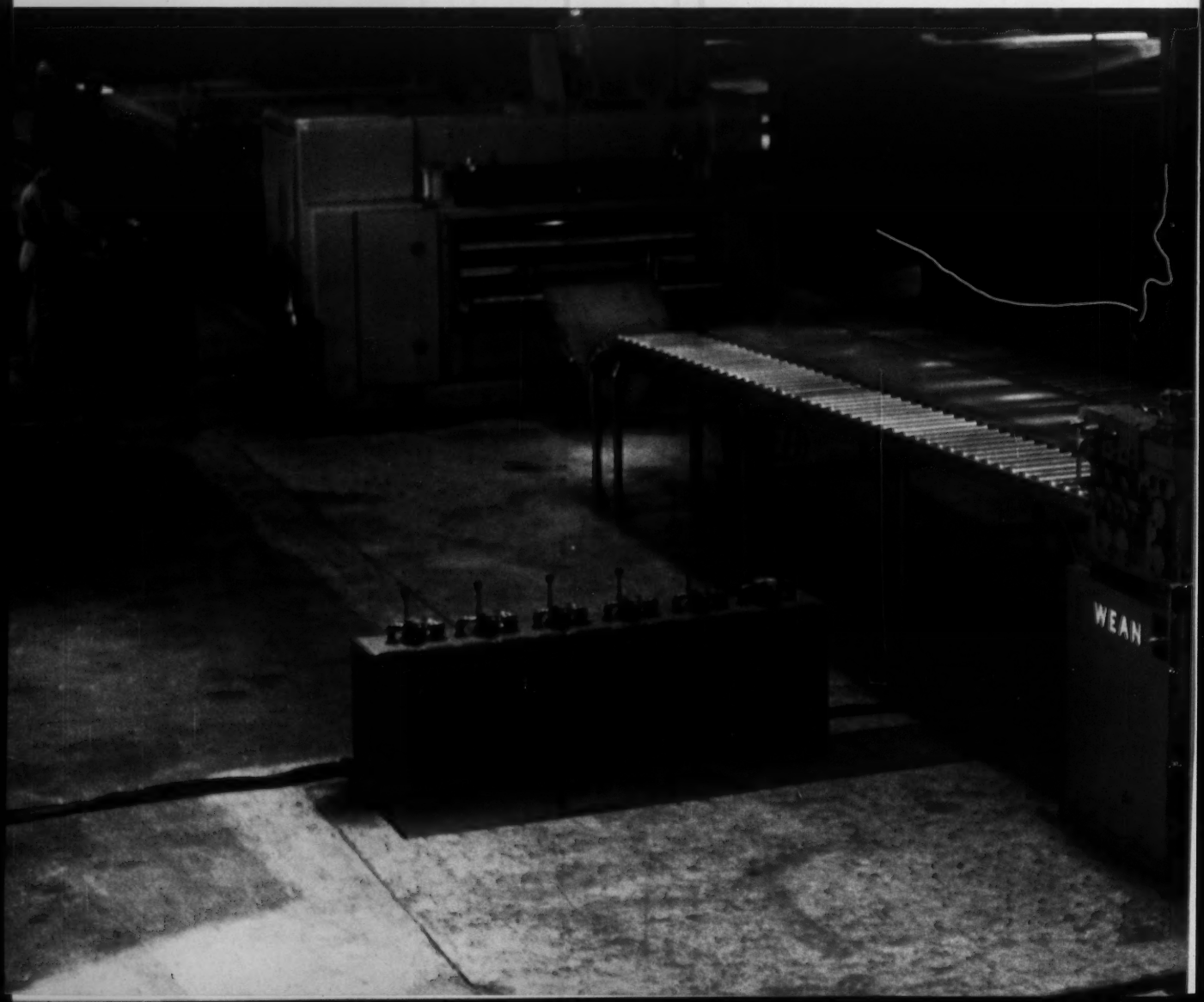
The most modern sheet and strip processing equipment available was recently installed in U. S. Steel Supply's Chicago, Los Angeles and Newark steel service centers. This equipment was built and installed by the Wean Equipment Corporation—an established leader in the design and manufacture of machinery for coiled metals processing.

For U. S. Steel Supply's sheet and strip customers, the installation of these coil processing facilities means faster, more efficient service. For example, the new "Flying Press" shearing line at our Chicago steel service center offers blanks in widths 18″ to 72″ and lengths from 18″ to 20′, and the new 52-inch slitting line offers widths of slit coil down to ½″. Both lines are designed to handle gauges from .015″ to .135″ in steel and aluminum.

This equipment produces blanks to a stretcher-levelled standard of flatness—ready for manufacturing operations. Resquaring is unnecessary! The availability of our equipment can eliminate a major capital expenditure by your company. Besides, you eliminate scrap loss, cut handling time and get right-to-your-production-floor delivery!

We're anxious to prove to you that U. S. Steel Supply has the finest sheet and strip service available today. Call your U. S. Steel Supply Steel Service Center on your next order. You'll find our phone number in the Yellow Pages under *Steel*.

USS is a registered trademark



Coil Processing Centers by:

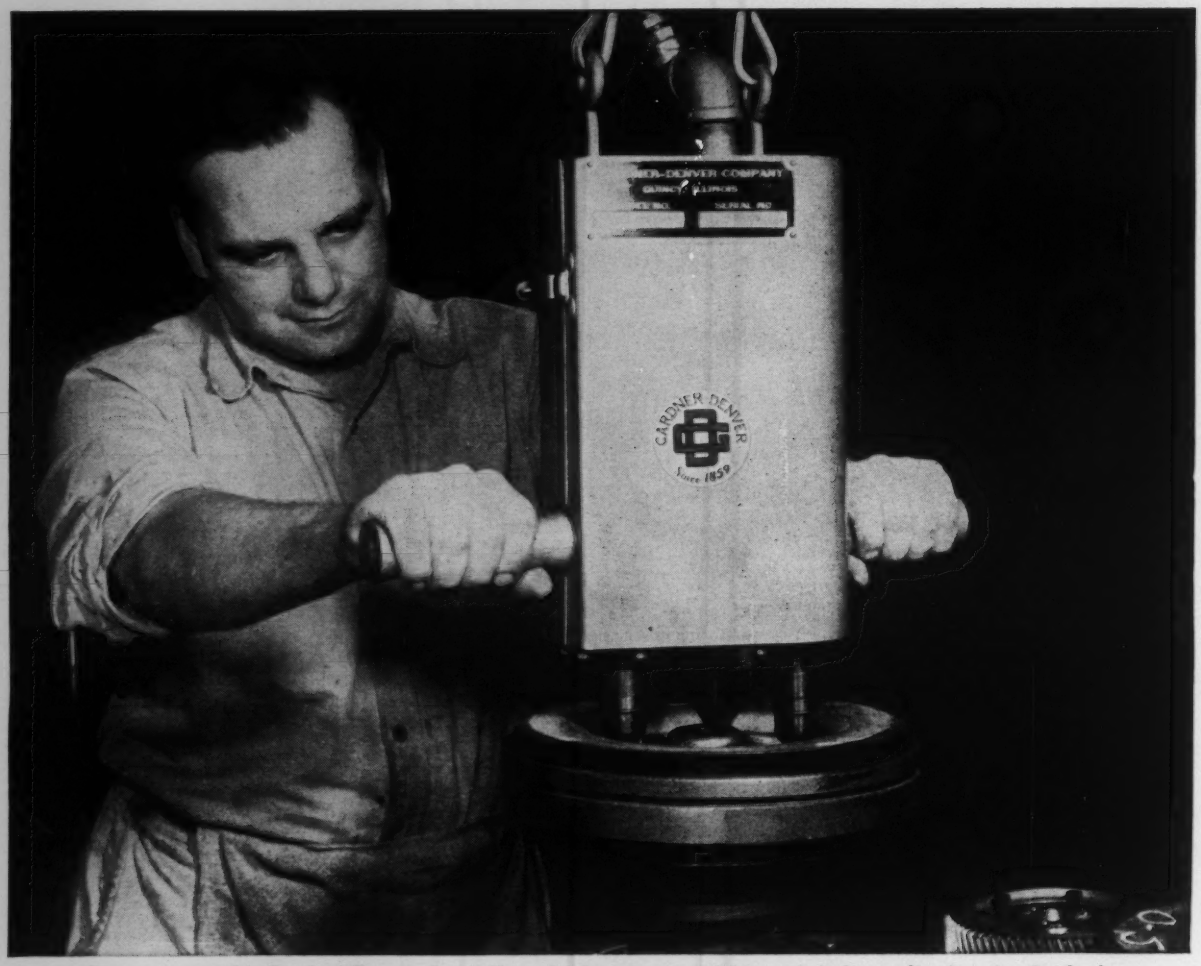
WEAN

Wean Equipment Corporation, Cleveland 17, Ohio

USS

U. S. Steel Supply Division of United States Steel

General Offices: 208 South LaSalle St., Chicago 4, Illinois



In two passes this Gardner-Denver 3-spindle multiple nut setter tightens six bolts on diesel engine flywheel.

Check this special multiple design for fast, accurate nut running

A CONSCIENCE FOR QUALITY

Gardner-Denver equipment at work throughout the world has the conscience of Gardner-Denver men behind it: designers, engineers, metallurgists, instructors, servicemen. To these men there's no substitute for quality, as at Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

Speed production, control torque with air-powered multiple nut setters—designed to do the job by Gardner-Denver. Motor units, throttle handle, dead handle, manifold—all components are specifically designed for fast, accurate multiple nut running. And all components are standardized units that can be assembled to any combination to run any number of nuts, with each nut tightened to specified torque—*all in a single operation.* Switching from job to job is quick and easy. When the bolt pattern changes, simply move the standard spindles and handles to a new job-tailored mounting plate.

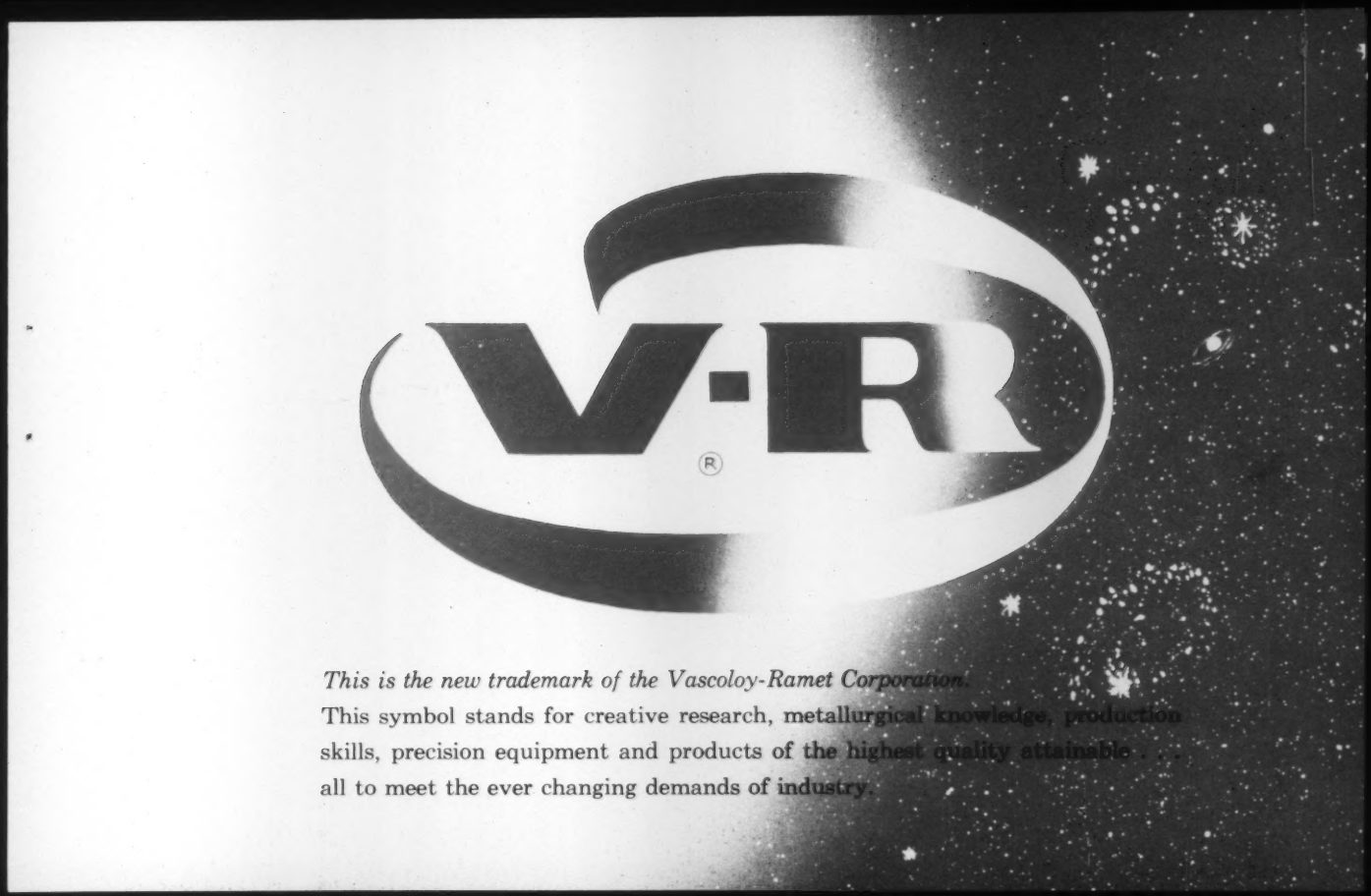
Whatever your production setup—from high-volume assembly lines to low production runs—Gardner-Denver multiple nut setters speed the job . . . cut time and costs. Contact your Gardner-Denver representative for complete information.

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

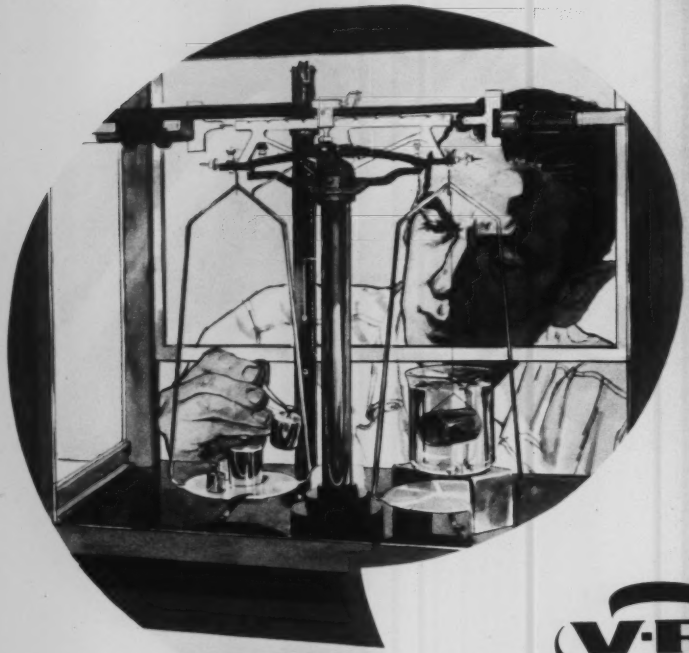
Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario



This is the new trademark of the Vascoloy-Ramet Corporation.
This symbol stands for creative research, metallurgical knowledge, production skills, precision equipment and products of the highest quality attainable . . . all to meet the ever changing demands of industry.

CREATING THE METALS
THAT SHAPE THE FUTURE



New metals for new needs through metallurgical research

Years of research, experimentation and comprehensive testing have been devoted to every type of product being manufactured at V-R. By working closely with all types of industry, this metallurgical knowledge is effectively applied to meet industry's ever-changing demands for refractory metals. Whether you need better cutting tool materials . . . parts with greater resistance to heat, wear and corrosion . . . or intricate parts cast to close tolerances, then V-R research in refractory metals can be of help to you.

V-R VASCOLOY-RAMET

CREATING THE METALS
THAT SHAPE THE FUTURE

Quality starts with purity

There's no secret to producing quality products at V-R. It's a simple matter of starting with highest purity raw materials and maintaining this purity and uniformity throughout all production processes.

A good example of V-R's quality control is this X-Ray Fluorescent Spectrograph which tells the exact composition and amount of each component in the material being tested . . . assuring purity of raw materials and uniformity of powdered metal compositions.

V-R VASCOLOY-RAMET

CREATING THE METALS
THAT SHAPE THE FUTURE

Constant checking assures consistent carbide performance

The consistent performance of V-R carbide is largely due to the varied and frequent quality checks at every step of the production process. Here, we see a metallograph being used to check grain structure and absence of porosity against rigid standards. Similar checks are constantly made to assure proper hardness, density and transverse rupture strength. This elaborate checking system assures that each piece of a specific V-R grade will always perform the same.

V-R VASCOLOY-RAMET

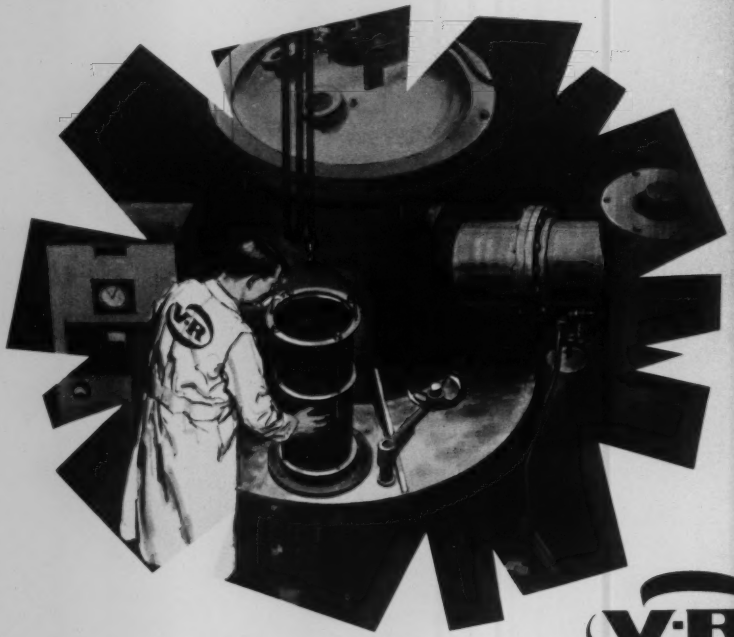
CREATING THE METALS
THAT SHAPE THE FUTURE

Precision equipment assures accurate shapes and sizes

No single method can produce all the sizes and shapes of products manufactured at V-R. For example, that's why five different pressing methods are used to meet industry's carbide needs. The press shown here is typical of modern accurate equipment used to compact carbide at V-R. Regardless of the method used, precision controls and the knowledge gained through long experience enable V-R to form metals to accurate dimensional requirements and proper density.

V-R VASCOLOY-RAMET

CREATING THE METALS
THAT SHAPE THE FUTURE



V-R vacuum sintering makes better cemented carbides

Vacuum sintered carbide grades are more versatile because precise control during vacuum sintering removes trace impurities . . . increasing the strength of V-R carbides and their ability to withstand cutting conditions which generate extreme heat. Vacuum sintering is one of the many reasons for the superior performance of V-R's new carbide grades for machining all types of steel and the new superalloys.

V-R VASCOLOY-RAMET

CREATING THE METALS
THAT SHAPE THE FUTURE

Finishing to customers' specifications

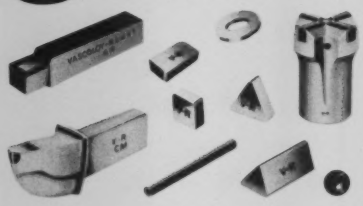
V-R from the first recognized industry's need for finished products ready for immediate use. People and equipment were then geared to manufacturing products to meet the varied specifications of industry. Thus, whether you use V-R metals in the form of blanks, inserts, brazed tools, wear parts, coal and rock bits or any of numerous other forms, you will find that V-R has the equipment and knowhow to fulfill your requirements.

V-R VASCOLOY-RAMET

CREATING THE METALS THAT SHAPE THE FUTURE

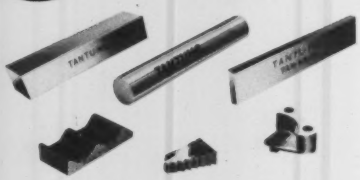
Metals that shape the future take many forms . . . *cutting tools* for all types of machining operations . . . *parts* designed for extreme resistance to heat, wear and corrosion . . . *mining bits* for increasing coal production . . . *percussion bits* for helping build turnpikes, dams and tunnels . . . *metals cast* to close tolerances eliminating costly machining operations . . . but, regardless of the form they take, all V-R refractory metals are playing an important role in shaping a better future.

V-R CARBIDE



V-R CARBIDE is produced in a wide range of grades, each with different characteristics for specific uses. Available in all types of blanks, inserts and brazed tools for machining . . . balls, discs, rods, tubes, special shapes and parts that resist heat, wear and corrosion . . . a complete range of coal mining bits and percussion bits.

V-R TANTUNG



V-R TANTUNG is an exclusive cast alloy with high red-hardness, high transverse rupture strength, high shock resistance and low coefficient of friction. Widely used as solid tool bits, cut-off blades, cast-to-form shapes and tipped tools. Also, Tantung, because of its characteristics, is one of the more popular V-R metals used for investment casting of small, intricate parts.

V-R CERAMIC VR-97

V-R CERAMIC VR-97 is an entirely new aluminum oxide cutting material for ultra-high speed machining. It outperforms all other ceramics. Proven in continuous production, it provides a better finish, better size control and a longer tool life with speed flexibility.

VASCOLOY-RAMET

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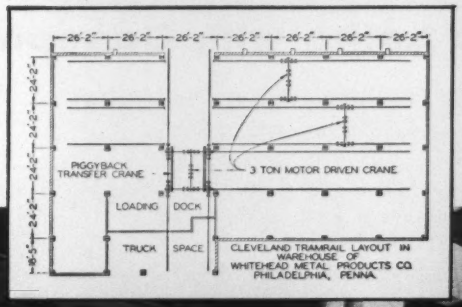
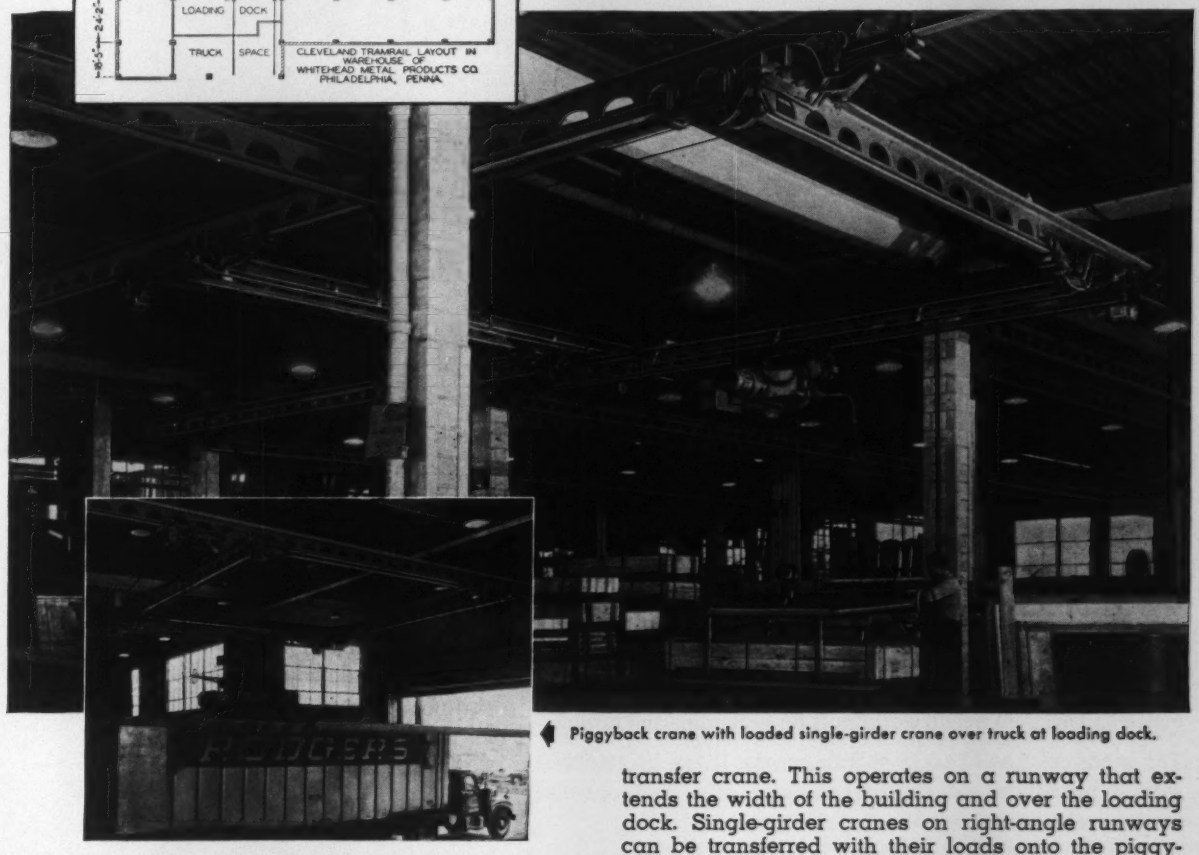
A-779

PIGGYBACK CRANE Solves Warehouse Handling Problem

Carries Load-Handling Cranes Between Building Columns



Piggyback crane carrying a single-girder crane, which in turn is transporting a case of aluminum sheets with sheet grab. All cranes are 3 ton capacity and motorized. They are easily operated by one man.



Piggyback crane with loaded single-girder crane over truck at loading dock.

THE many regularly spaced building columns in the warehouse of Whitehead Metals, Inc., Philadelphia, posed a tricky problem for the economical handling of flat cases of sheet metal and rectangular crates of pipe and tube, and the multitude of odd shaped cases carried by this metal distributor.

Overhead materials handling equipment was desired because of inherent advantages; such as, enabling maximum use of floor area for storage, higher piling, elimination of serious truck damage to floors and low cost of maintaining overhead equipment. It was also desired that the handling equipment provide complete floor coverage and be as efficient an arrangement as possible.

Cleveland Tramrail engineers solved the problem by designing a special double-girder piggyback transfer crane. This operates on a runway that extends the width of the building and over the loading dock. Single-girder cranes on right-angle runways can be transferred with their loads onto the piggyback and carried to any right-angle runway or directly over a truck at the loading dock. This makes possible fast, easy conveyance of materials between all points covered by the Tramrail system.

This is only one of thousands of unusual handling problems solved by Cleveland Tramrail engineers. No matter how simple or complex your problem is, we recommend that you call Cleveland Tramrail early in your planning.

Write for free booklet No. 2008

CLEVELAND TRAMRAIL

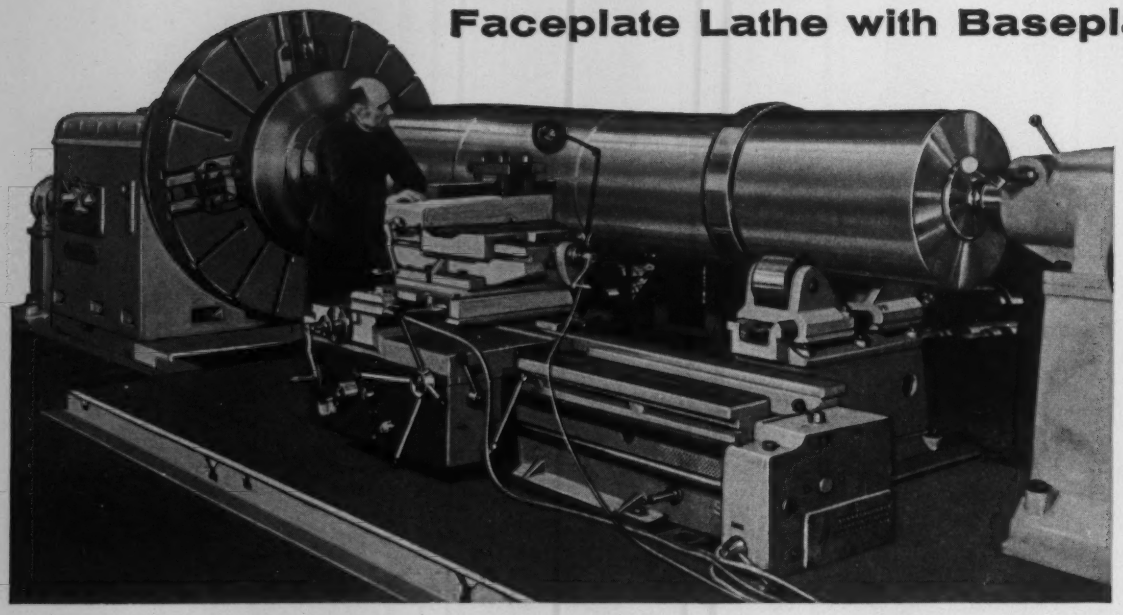
Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 4855 E. 290 ST. • WICKLIFFE, OHIO

Unparalleled Versatility!

RAVENSBURG

Faceplate Lathe with Baseplate



Ravensburg Faceplate Lathe showing headstock, tailstock, steady rest, carriage and baseplate in working position. Note "Electric-Shaft" Drive (arrow).

The headstock and bed of Ravensburg Faceplate Lathes are separate units, with the tailstock traveling on special baseplate slideways. The bed can be positioned on the baseplate either perpendicular or parallel to the turning axis, or at any intermediate location. This ultra-versatility is especially valuable in machining large, relatively light workpieces; such as missile bodies or nose cones, and medium weight workpieces for generators and turbines.

The headstock has 12 to 18 spindle speeds. It can be equipped with a mechanical or electrical variator drive and constant cutting speed control.

Accurate feeding of the carriage, in inches per revolution, is obtained through a patented "electric-shaft" drive, which eliminates any mechanical linkage with the headstock, and permits independent positioning of the bed on the baseplate. The cross slide carries an upper slide which is mounted on a rotary base and feeds automatically in any direction.

Electric or hydraulic copying devices are available to meet specific requirements.

SPECIFICATIONS

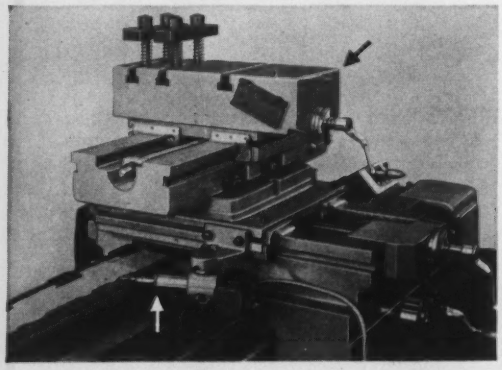
Center Distance—virtually unlimited!

Swing over Baseplate—110″

Max. Faceplate Diameter—138″

Five standard models—
many combinations from which to choose.

Special designs available upon request.



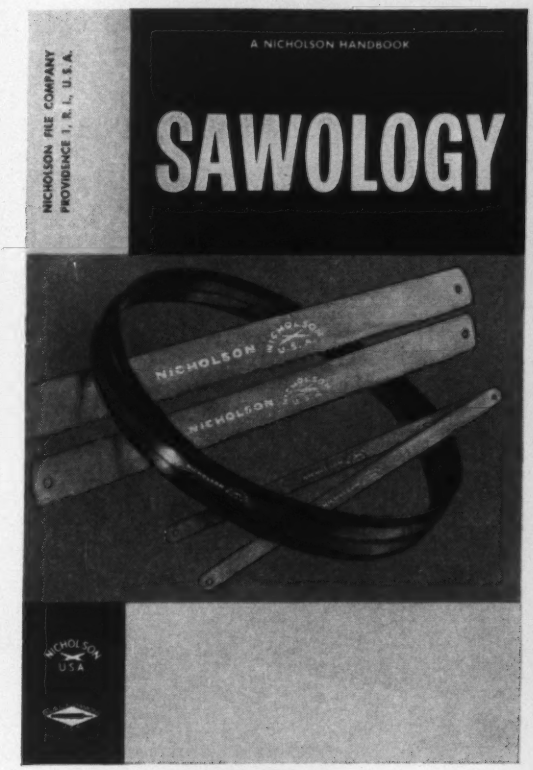
Upper slides of carriage showing electric copying device (arrow), Rotary base (arrow) and manually controlled tool slide.

Write today for fully descriptive literature

COSA

Importers of Leading Precision Machine Tools
Nationwide Sales and Service
COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

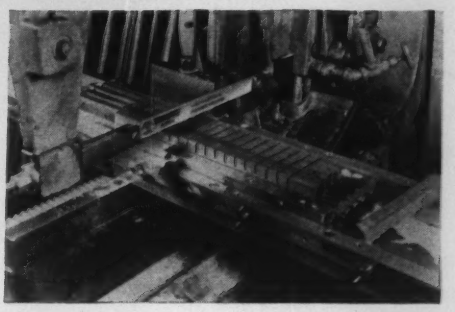
FREE! FROM NICHOLSON—34-PAGE HANDBOOK ON METAL-CUTTING SAWS. SEND FOR YOUR COPY TODAY!



Material	Teeth Per In.	Strokes Per Min.
FERROUS		
Drill Rod	10	90
Forging Stock, Alloy	4-6	90
Forging Stock, Mild	3-4-6	120
Iron, Cast	6-10	90-120
Iron, Malleable	6-10	90
Rails	6-10	60-90
Steel, Alloy	4-6	60-90
Steel, Carbon Tool	4-6	90-120
Steel, High Speed	6-10	60-90
Steel, Machinery	3-4-6	90-120
Steel, Stainless	3-4-6	60-90
Steel, Structural	6-10	90-120
Steel, Die Blocks	4-6	60-90
Steel Pipe	6-10	120
Tubing, Thick Wall	6-10	120
Tubing, Thin Wall	14	120
NON-FERROUS		
Aluminum	3-4-6	120
Babbitt	4-6	120
Brass Castings, Hard	4-6	90-120
Brass Castings, Soft	4-6	120
Bronze Castings	4-6-10	90
Bronze, Manganese	6-10	60-90
Copper Bars	3-4-6	90
Copper Tubing	10	120
Monel Metal	4-6	60-90

This chart *(left)* has been developed as a helpful guide in selecting the best blade tooth and stroke speed for ferrous and nonferrous materials.

This picture *(below)* shows the use of a power blade holder extension, which for certain cutting jobs permits the use of a shorter blade in the machine . . . reducing cost.



Handy textbook manual contains complete and useful information for shop superintendent, production foreman, mechanic, machinist, maintenance man, purchasing agent, mechanical trainee . . . everyone connected with the management and operation of your shop, plant or industry.

HERE'S a book that can save you money. It's the first of its kind dealing with the manufacture, proper selection, effective use of saws for cutting ferrous and nonferrous metals, hard plastics and rubber, wood . . . other dense materials.

It was written especially for Nicholson and draws upon all our facilities, skills and experience with metal-separating jobs and appropriate tools.

Following is a partial listing of topics discussed: "How to get the most out of hand hacksaw blades," "Power hacksaw tooth selector," "Hints on the use and care of power hacksaw blades," "Band saw blade and tooth selector," "Friction sawing," "Contour sawing."

Pages are illustrated with numerous photographs and diagrams. Text is straightforward in easy-to-understand terms for *everyone* who deals with metal sawing.

"Sawology" has just been published and is now available. It is designed to help you make the most efficient and economical use of all metal-cutting blades. And it's available without cost to you. Just clip and mark the coupon.

Industrial Distributors provide the finest goods and services in the least possible time. Our products are sold exclusively through them.

NICHOLSON NICHOLSON U.S.A. BLACKHAWK U.S.A.

NICHOLSON FILE COMPANY, PROVIDENCE 1, RHODE ISLAND

FILES AND ROTARY BURS • HACKSAW AND BAND SAW BLADES
GROUND FLAT STOCK • INDUSTRIAL HAMMERS

Mark and mail this coupon today.

NICHOLSON FILE COMPANY, Providence 1, Rhode Island

Gentlemen: Please send me a free copy of your new book, "Sawology."

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Firm_____

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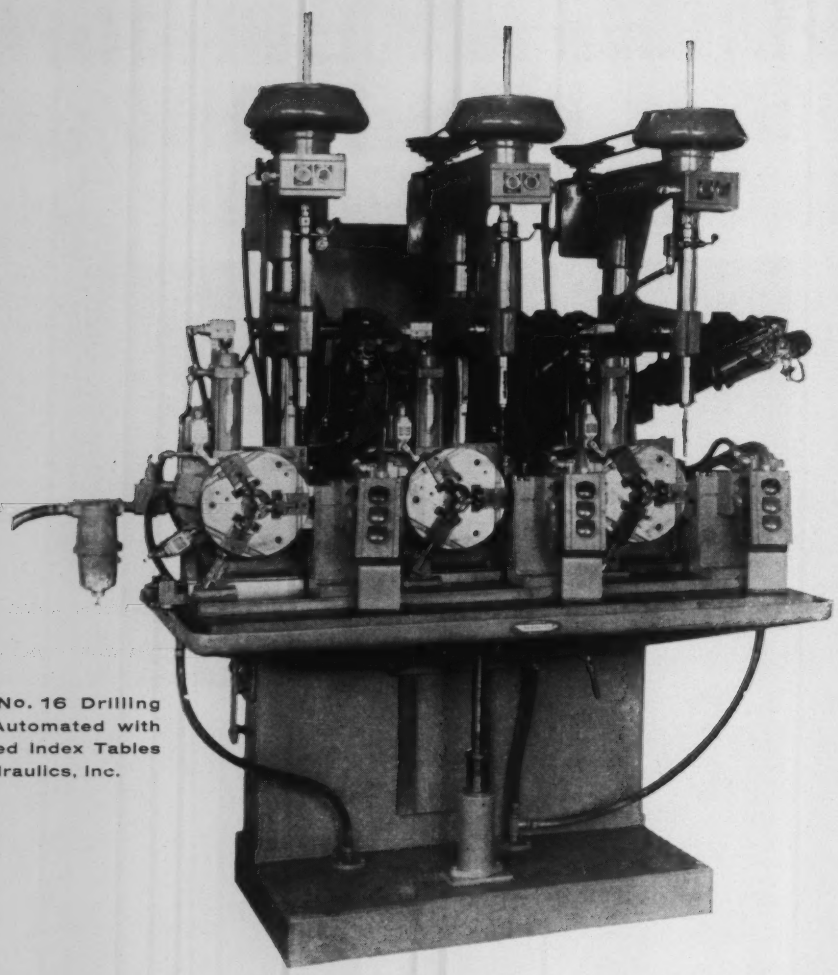


"Buffalo" No. 16 Drilling Machine Automated with Air-Operated Index Tables by Air Hydraulics, Inc.

8 YEARS OF SATISFACTION MADE THIS SALE!

Nothing sells a product like customer satisfaction. Here's proof:

Eight years ago a large mid-western manufacturer bought a "Buffalo" No. 16 Drilling Machine. It proved to be an excellent production machine. Quantity and quality of output were high. The No. 16 stood up to the punishment of continuous production with a minimum of maintenance.

This year the manufacturer decided to automate certain drilling and reaming operations. Because of eight years of complete satisfaction, a new 3 spindle "Buffalo" No. 16 Drilling Machine was specified.

The mechanism for automating the "Buffalo" Drill was designed and built by Air-Hydraulics, Inc. of Jackson, Michigan. Air-Hydraulics used its Model "H", 10" dia. Air-Operated Index Tables. The automated operation was drilling and reaming three lug-holes on the work piece.

The production rate was originally estimated at 150 pieces per hour. Air-Hydraulics reports that the actual production rate is 215 pieces per hour.

Here's a case of "three-way" satisfaction, with "Buffalo" Drills. Both the manufacturer and Air-Hydraulics are satisfied. And we are happy that our customer's satisfaction dictated the choice of a new "Buffalo" No. 16 Drilling Machine for this automation job.

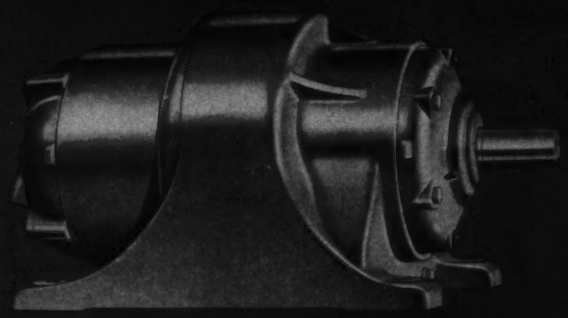
For this kind of complete satisfaction, why don't *you* specify "Buffalo" Drills? Contact your "Buffalo" machine tool dealer, or write us direct for full information.

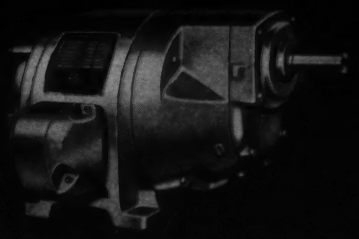
BUFFALO FORGE COMPANY

492 Broadway Buffalo, N. Y.

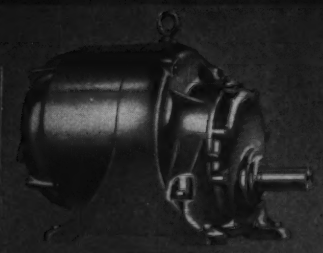
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING • PUNCHING • SHEARING • BENDING





TYPE CH
SINGLE REDUCTION SYNCROGEAR
1/3 TO 30 H.P.

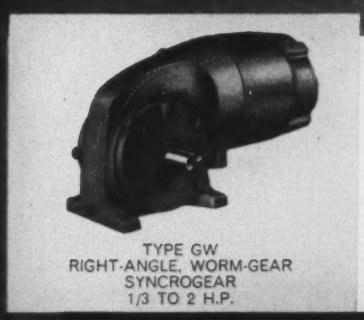


TYPE GR
SINGLE REDUCTION SYNCROGEAR
1/4 TO 30 H.P.

whatever you need in geared power... whatever the speed...whatever the horsepower...specify

U.S. Syncrogear...now with gears honed to super finish!

Again U.S. introduces a new first in gearmotor design: Gears *honed to super finish* for quiet, smooth running and longer life. A long succession of Syncrogear innovations by U.S. during the last 25 years have been widely adopted. **Through-hardening** of gears... the **solid-shank pinion**... the sturdy **"pyramidal" base... micro-shaving** of gears... solid cast **one-piece case**..."crowned" helical gear teeth of **elliptoidal design**... all these add years of trouble-free operation to Syncrogear life. To assure precision, U.S. makes its own gears. For more information on U.S. Syncrogear features, send for free color brochures: Syncrogear Bulletin No. F-1880, Right-Angle Worm-Gear Syncrogear Bulletin No. F-1650, or Shaftmount Syncrogear Bulletin No. F-1994.

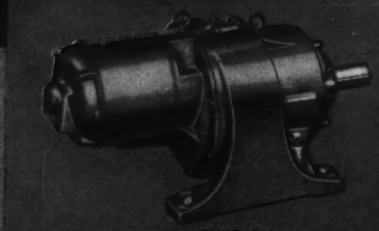


TYPE GW
RIGHT-ANGLE, WORM-GEAR
SYNCROGEAR
1/3 TO 2 H.P.

TYPE GDV
VERTICAL SYNCROGEAR
3 TO 30 H.P.

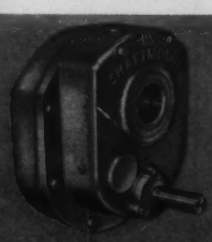
U.S. ELECTRICAL MOTORS INC.
P.O. Box 2058 • Los Angeles 54, California, or Milford, Connecticut

You are cordially invited to visit our booths, 1704-1706, at the Design Engineering Show in New York's Coliseum, May 23 through 26.



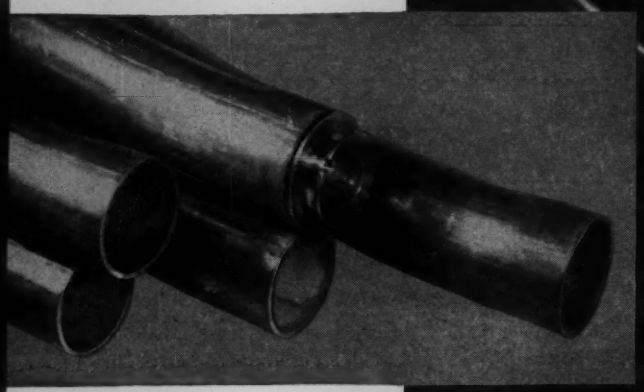
TYPE GM
TRIPLE REDUCTION SYNCROGEAR
1 TO 10 H.P.

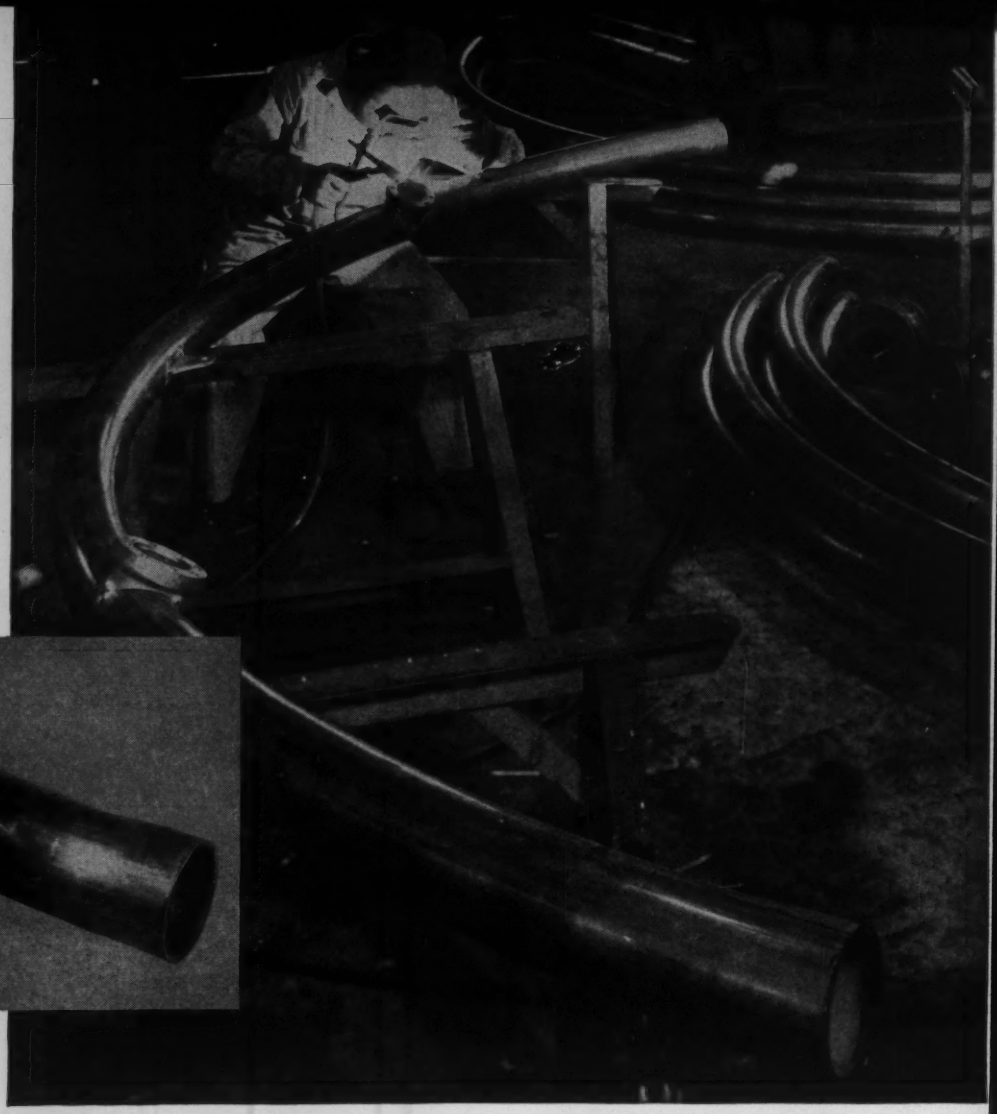
TYPE GDF
MOTOMOUNT SYNCROGEAR
1 TO 60 H.P.



TYPE GC
SHAFTMOUNT SYNCROGEAR
1/4 TO 40 H.P.

Non-Magnetic and salt-corrosion-resistant Republic ELECTRUNITE® Stainless Steel Tubing, Type 304, 4½" O.D., was used to fabricate corona rings for a powerful East Coast Navy Radio Station. Despite the rather severe bend of the 15- and 20-foot rings, the fabricator reported no trouble whatsoever. The rings were made in three sections. ELECTRUNITE was bent to the correct radius. Three lugs were welded to each section. The ends were flared for the insertion of a plug used at the erection site to assemble the three pieces into a complete ring and suspend it from towers approximately 1,400 feet high. The fabrication was handled by Jentsch & Company, Inc., Buffalo, New York, subcontractors to Lapp Insulator Company, Leroy, New York.





Bend, Flange, Weld, Easy-to-Fabricate ELECTRUNITE STAINLESS STEEL TUBING

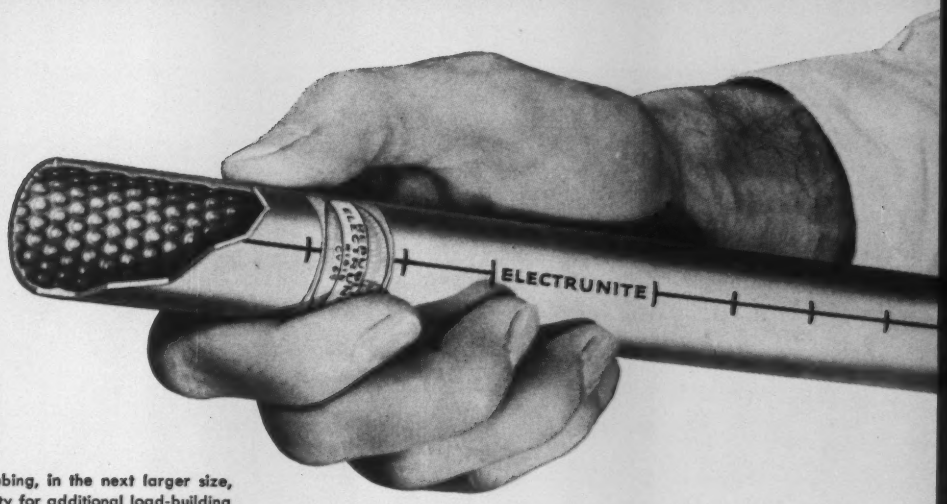
ELECTRUNITE Stainless Steel Tubing and Pipe are available in A.I.S.I. chrome-nickel analyses. Sizes range from ⅜" O.D. to 5" O.D. Pipe sizes are available from ⅛" I.P.S. through 2" I.P.S. in ASA schedule 40S; from ⅛" I.P.S. through 4" I.P.S in schedule 10S; and from ½" I.P.S. through 4" I.P.S. in schedule 5S wall thicknesses.

This fabricator needed a reliable source to supply large diameter heavy wall stainless steel tube for corona rings. From its large size range, Republic was able to provide the proper tube for this vital application.

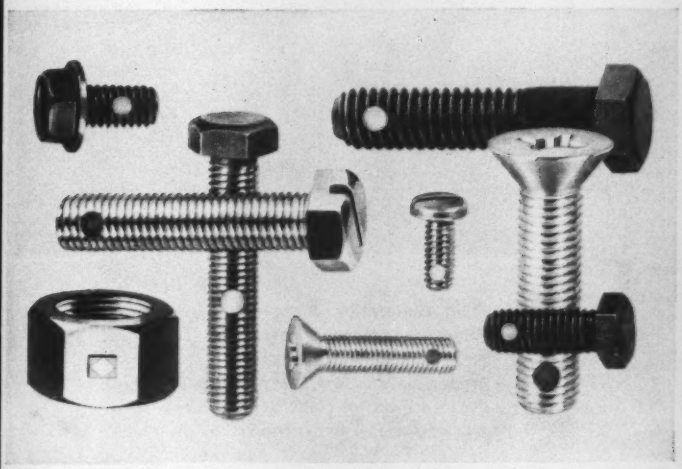
Most experienced welded tube maker, and world leader in the production of stainless and alloy steels, Republic has all the facilities to qualify as your number one source. Complete range of sizes, gages, wall thicknesses. Broad distributor stocks. Large inventories of mill stocks to draw on. Top reputation for quality and for ability to meet deliveries. Technical and metallurgical assistance. Fast service: price and delivery quotations to you within twenty-four hours.

For applications requiring pressure-tested tube, Republic offers exclusive FARROWTEST —the ultimate in non-destructive testing. This eddy-current test probes for and detects defects so minute they pass other, less positive tests. Tube quality is measured for you!

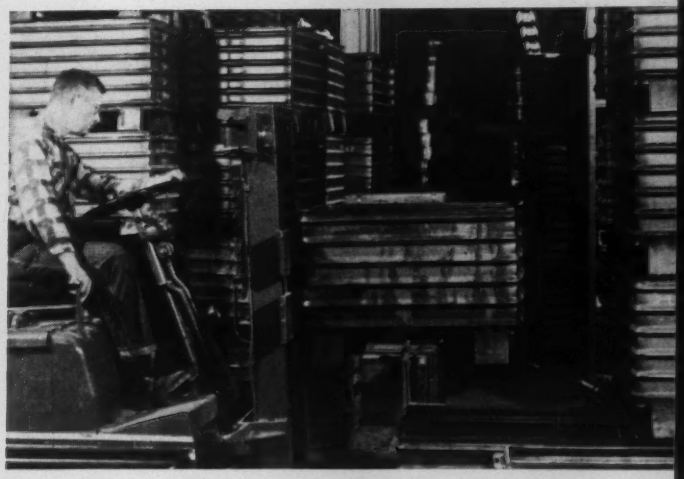
Send in your inquiries for Republic ELECTRUNITE Stainless Steel Tubing and Pipe. You'll like the product . . . and the service.



REPUBLIC ELECTRUNITE® Electrical Metallic Tubing, in the next larger size, provides raceways today with built-in capacity for additional load-building tomorrow to meet the demands of expanding production . . . at no extra cost. With the pull-in, pull-out advantages of ELECTRUNITE, you have built-in capacity up to 40% and more. Include ELECTRUNITE in your specifications for new building, plant expansion, or remodeling programs. Ask your electrical contractor, or send coupon for additional information.



REPUBLIC NYLOK® SELF-LOCKING FASTENERS provide a single-unit answer to vibration, shock, and tension. A permanent nylon insert forces mating threads together for maximum holding power in any position. The relatively inert nylon resists age and moisture; its natural resiliency permits easy adjustment and repeated use. Republic Nylok Fasteners are non-galling and require no lubricants. Send coupon for descriptive literature; specify bolts or nuts, or both.



MODERNIZE YOUR MATERIALS HANDLING with standard Republic Units in designs, sizes, and styles, to solve your problems. For example, Republic Skid Boxes are designed with heavy-duty stacking brackets for stacking, storing, shipping convenience. Corrugated box construction delivers long, efficient service at low cost. Let materials handling engineers of Republic's Berger Division work with you in solving your materials handling problems. Call your Republic representative, or write today.

REPUBLIC STEEL

REPUBLIC STEEL

World's Widest Range
of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
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1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send additional information on the following products:

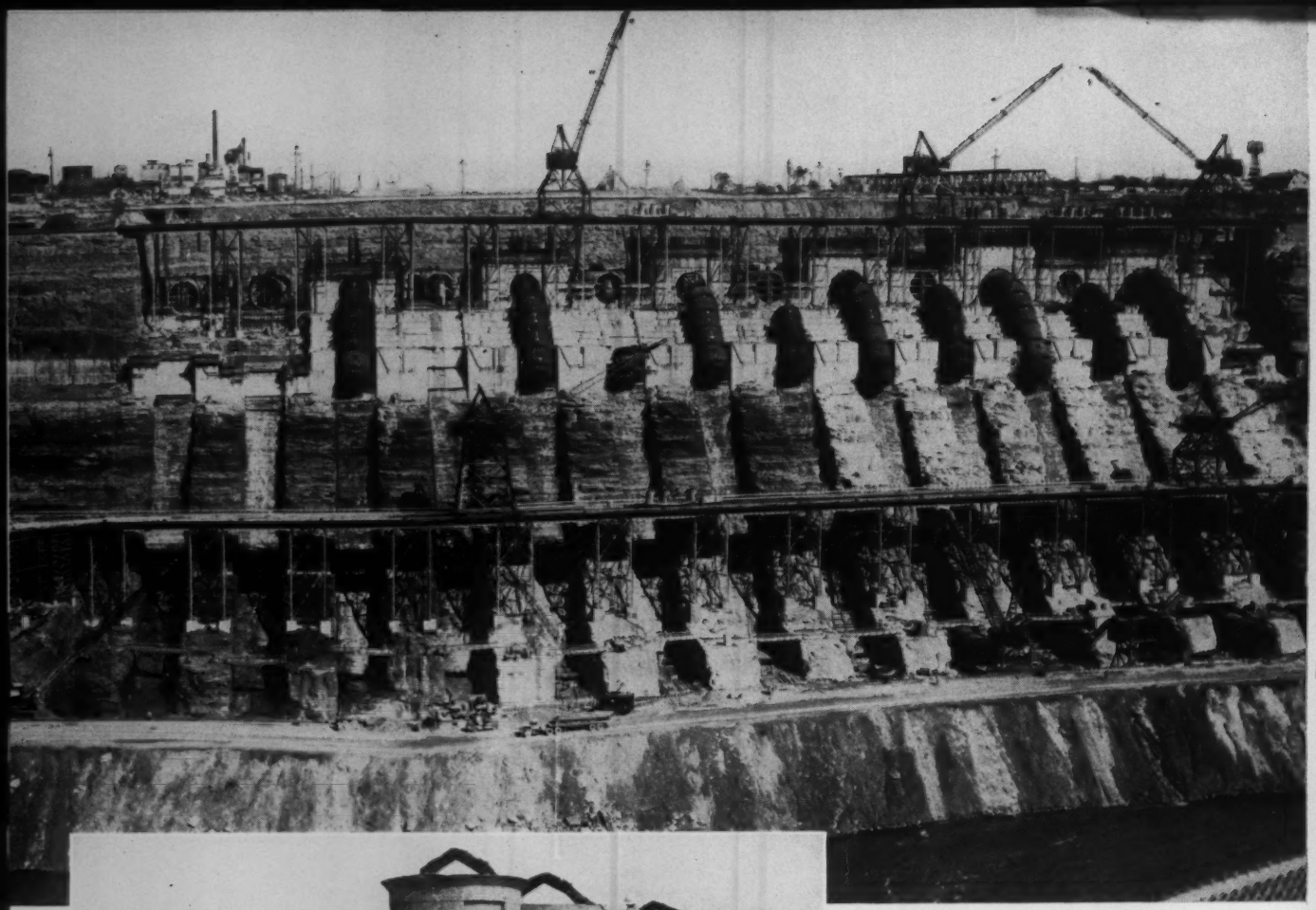
- ☐ Republic ELECTRUNITE Stainless Steel Mechanical Tubing
- ☐ Republic ELECTRUNITE Electrical Metallic Tubing
- ☐ Republic Materials Handling Equipment
- ☐ NYLOK FASTENERS

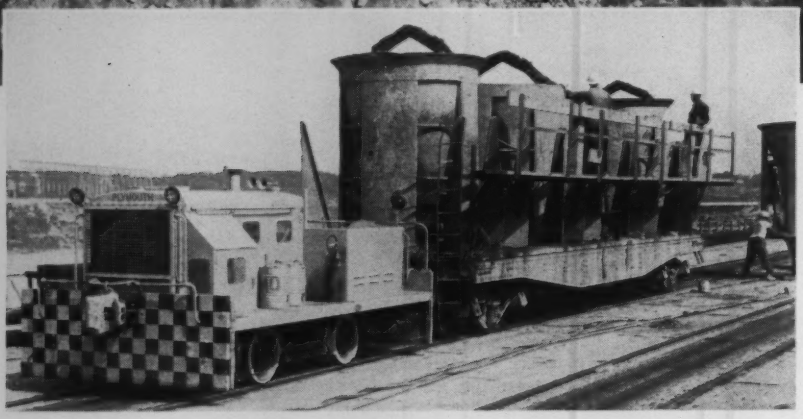
Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____





Main Generating Plant — Niagara Power Project — Lewiston, New York

Like a massive stage setting, viewed from the Canadian side, is the Main Generating Plant of the Niagara Power Project of the Power Authority of the State of New York. Located five miles below Niagara Falls, this power project will harness the full potential of the United States share of Niagara Falls. When completed, it will produce 1,950,000 KW of electrical power.

"Plymouth *versatility* speeds power project"

Six remote-controlled Plymouth Locomotives help speed construction operations for Merritt-Chapman & Scott Corporation, contractor for the main generating plant of the giant Niagara Power Project. In round-the-clock operations, these locomotives move concrete cars from the batch plants to the gantry cranes which place the concrete buckets in position for pouring.

Each Diesel-hydraulic Locomotive is operated from a control station on the concrete car, where the operator can oversee car spotting under the batch plant and attach the crane clevis bolts to the pouring buckets at the construction site. Visibility is excellent in both directions and full control is exercised without an operator on the locomotive itself.

Special problems find quick solution in Plymouth Locomotives. On-the-job dependability and minimum maintenance, coupled with smooth hydraulic power transmission have made Plymouth the choice on construction and tunnel jobs the world over. To check on a Plymouth Locomotive or Mine-O-Motive suited to your haulage needs, simply send a brief outline of your operations to: The Fate-Root-Heath Company, Dept A-2, Plymouth, Ohio. Purchase Plans available.

PLYMOUTH® LOCOMOTIVES

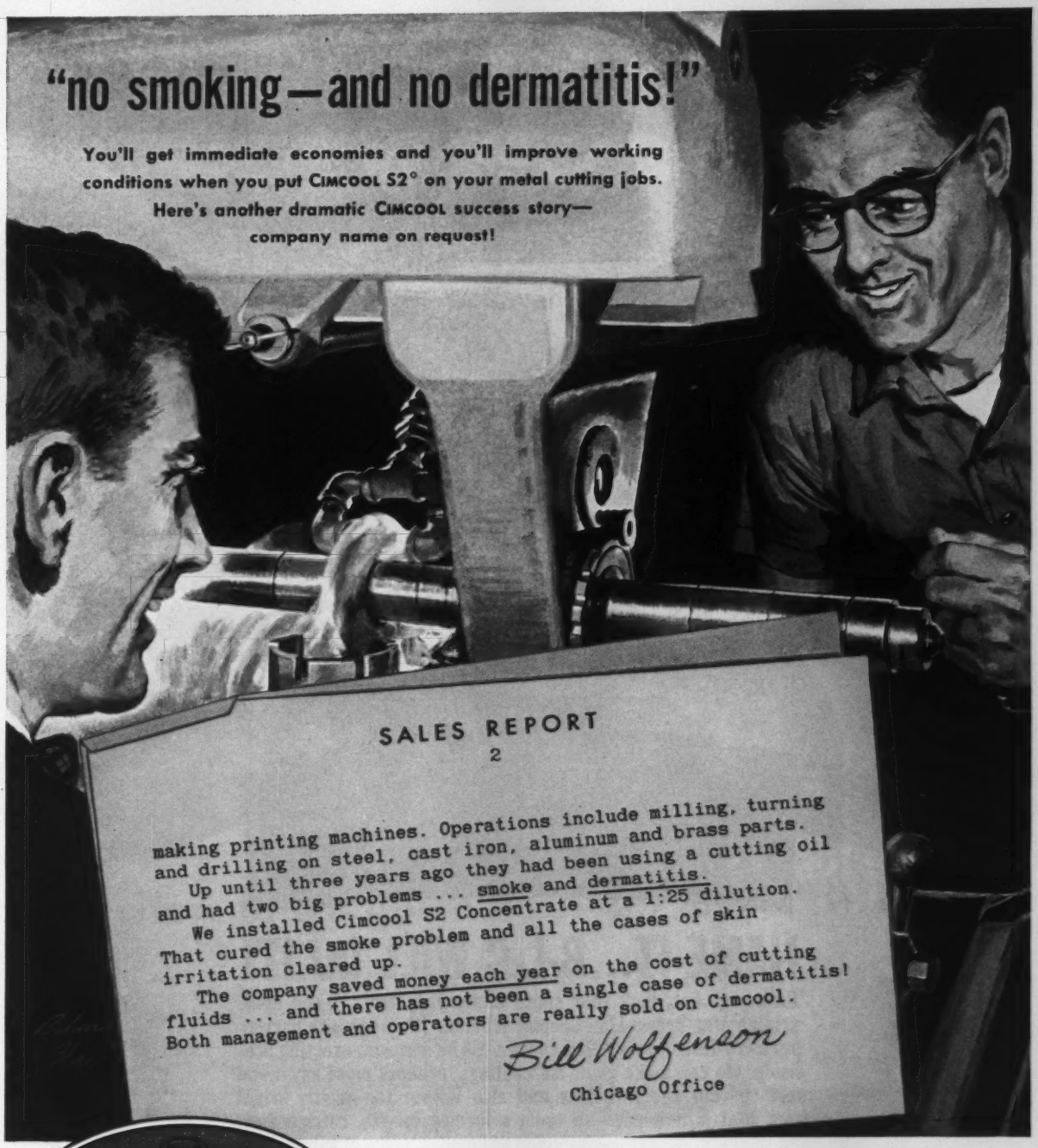
WITH TORQOMOTIVE DRIVE

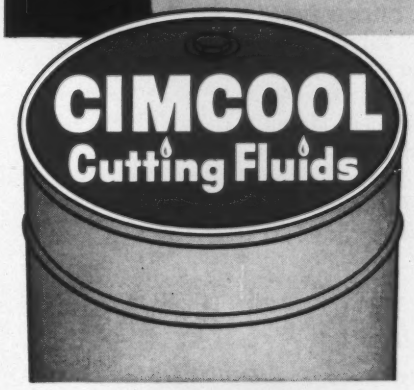
RAIL POWER

PLYMOUTH LOCOMOTIVES in Progressive Industry throughout the world

"no smoking—and no dermatitis!"

You'll get immediate economies and you'll improve working conditions when you put CIMCOOL S2° on your metal cutting jobs. Here's another dramatic CIMCOOL success story—company name on request!


SALES REPORT
2
making printing machines. Operations include milling, turning and drilling on steel, cast iron, aluminum and brass parts.
Up until three years ago they had been using a cutting oil and had two big problems ... smoke and dermatitis.
We installed Cimcool S2 Concentrate at a 1:25 dilution. That cured the smoke problem and all the cases of skin irritation cleared up.
The company saved money each year on the cost of cutting fluids ... and there has not been a single case of dermatitis! Both management and operators are really sold on Cimcool.
Bill Wolfenson
Chicago Office



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

CIMCOOL S2 Concentrate — The pink fluid which covers 85% of all metal cutting jobs.
CIMPERIAL° — Newest in the famous, industry-proven line of CIMCOOL° Cutting Fluids.
CIMPLUS — The transparent grinding fluid which provides exceptional rust control.
CIMCUT Concentrates (AA, NC, SS) — For every job requiring an oil-base cutting fluid.
ALSO — CIMCOOL Tapping Compound — CIMCOOL Bactericide — CIMCOOL Machine Cleaner.

For full information on the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

°Trade Marks Reg. U. S. Pat. Off.

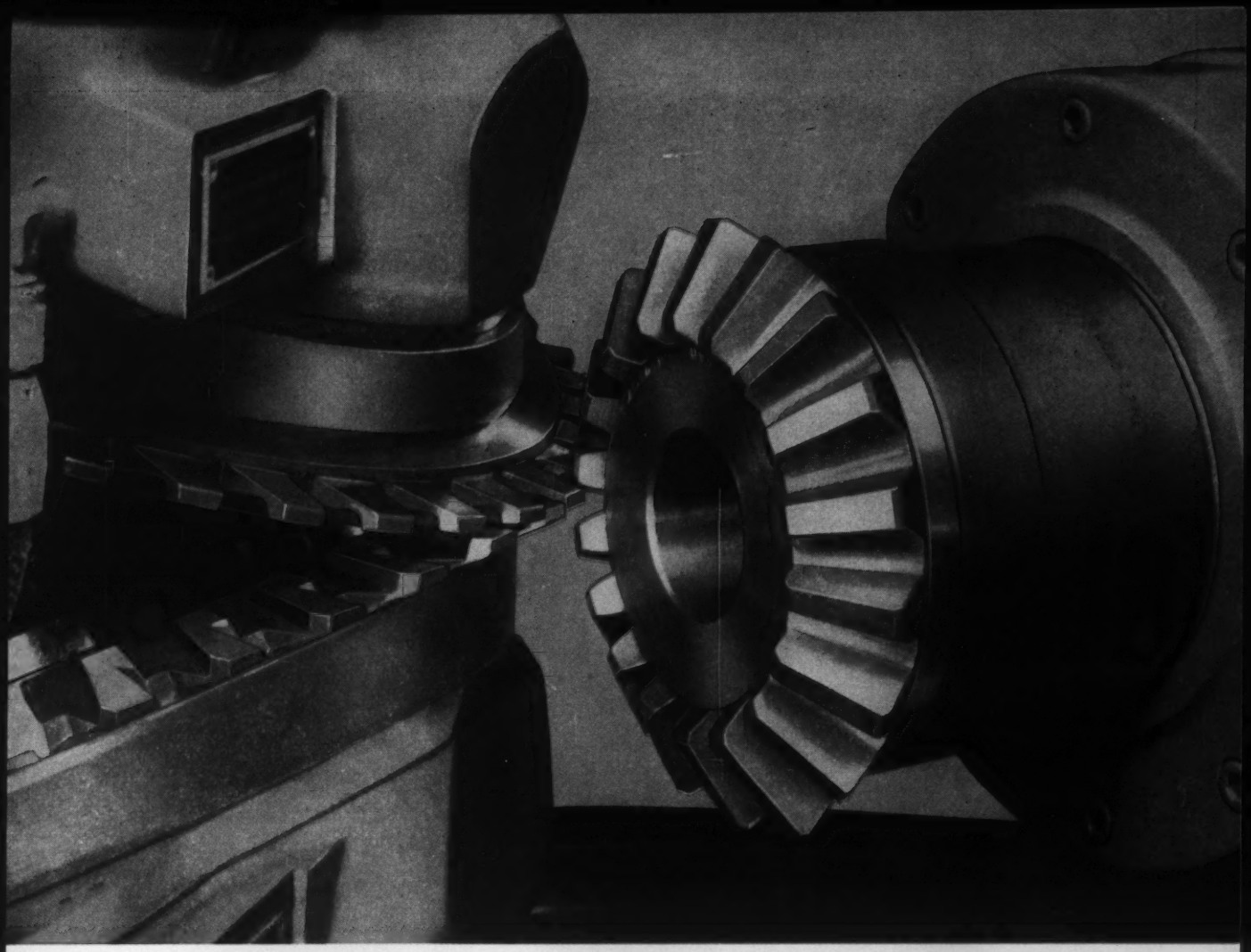
NAME IT...B-L-C WILL DO IT!

Grab your hat, tuck your specs under your arm . . . and head straight for Brown-Lipe-Chapin! Whether it's a massive part or intricate design, your requirements will be met with exacting precision. We can make giant die castings, process most any metal part to your specifications and also deliver top-quality bright work that is now used on today's leading ranges, refrigerators and washers, as well as for some of America's finest automobiles. We can also help improve your product's quality, cut your production time, keep costs to a minimum. Your product can be stamped, pressed, die cast, rolled or stretch bent—then polished, plated, anodized, painted and shipped to meet your schedules from either of our plants at Elyria, Ohio, or Syracuse, New York. And our experienced engineers guide your job every step of the way! For full information, call or write Customer Services, Brown-Lipe-Chapin, Syracuse, N.Y.

GM GENERAL MOTORS

RELIABILITY by BROWN·LIPE·CHAPIN

DIVISION OF GENERAL MOTORS CORPORATION



How to complete gears up to 16" O.D. in one cut from the solid

The Gleason No. 114 Straight Bevel Coniflex® Generator cuts gears directly from the solid in diameters up to 16", up to 2½" face width and 2½ diametral pitch.

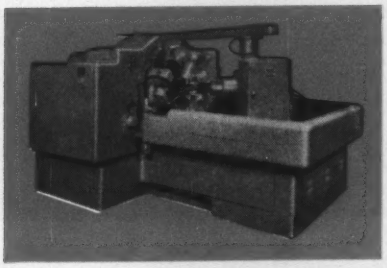
With it you obtain much faster production rates—up to five times faster than with other methods. Still it retains a basic flexibility which permits quick changeovers from one job to another.

Excellent quality. Even with the speed of the No. 114 Coniflex Generator, quality remains excellent. It provides a smooth blend of root, fillet, and tooth flank—your assurance of strong, accurate teeth.

Coniflex gears give localized tooth bearing, too, assuring practical assembly tolerances.

Simplified calculations. You can do all calculations with a slide rule. You can also control tooth bearing easily to suit various operating conditions or to set up interchangeability with existing gears.

For more details on the No. 114, write for bulletin.



GLEASON WORKS

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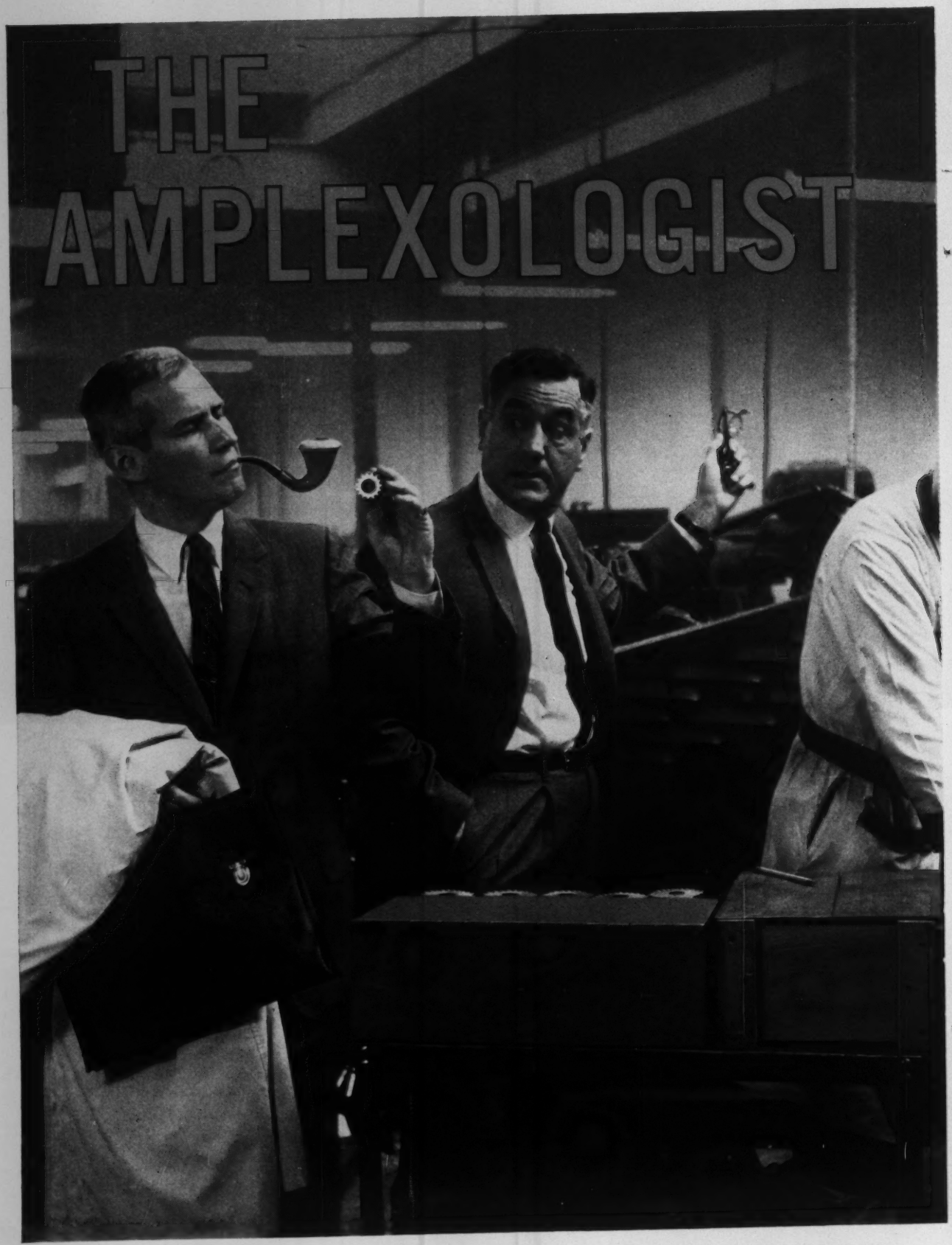

THE
AMPLEXOLOGIST

The Amplexologist is sometimes detected about to pocket a part in a prospective customer's plant. Especially a part being machined from a rough casting or hogged out of steel. Just the sight of it starts wheels whirling in the Amplexologist's head.

Why all the machining? Is this scrap necessary? Could we make the part out of powder metal? Eliminate machining costs. Eliminate scrap. Deliver a finished precision part for the price of a rough casting. Less, maybe?

Well! Thoughts like these are enough to make the Amplexologist forget his mother's maiden name. No wonder it sometimes takes a pointed stare to remind him to ask permission to pick up the part and take it back to the office and figure precisely how to make it better and cheaper through advanced powder metallurgy.

Customers usually forgive him the sins of his enthusiasm. It has saved them thousands of dollars. We can afford to forgive him, too. He has helped make us the world's largest, most experienced producer of powder metal parts. He is the reason manufacturers say: **When it comes to powder metallurgy—Amplex has the answer.**

FOR THE BENEFIT OF SKEPTICS . . .

The part shown is a combination gear and compound cam. Formerly, it was an 8-piece assembly: fibre gear, steel flange, horizontal steel cam, vertical steel cam, four steel screws. Then the Amplexologist went to work. Today, the part is produced by powder metallurgy as a single unit—a finished precision part that requires no machining.

Cost reduction: about 90%. What's more, the powder metal part provides longer wear, quieter operation.

Photograph permission RCA.

AMPLEXOLOGIST

SEND COUPON **. . . if you'd like to talk over your product with the Amplexologist. Don't hesitate. He's always happy to get out of the office.**

AMPLEX DIVISION • CHRYSLER CORP. • Dept. 14
P.O. Box 2718 • DETROIT 31, MICH.

Please have the Amplexologist call to look into the possibility of using powder metal parts in our product.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

PRODUCT_____

AMPLEX

DIVISION CHRYSLER CORP.

A CHRYSLER OILITE® PRODUCT

New from Wright!

Built-In Overload Protection for Operator, Load and Hoist with the New Wright Overload Cutoff*!

• Now, for the first time on any electric hoist, you can have safe, sure mechanical overload protection as a built-in feature with the **WRIGHT Overload Cutoff.** Designed and built to fit any new WRIGHT *Speedway* Electric Hoist, the Overload Cutoff unit you see pictured above is a compact, integral part of the hoist frame itself. As a result, it becomes a functional part of the hoist *at no sacrifice in headroom.* The WRIGHT Overload Cutoff is simple in design and should give dependable, trouble-free operation during the entire life of the hoist under normal operating conditions. Calibrated and sealed at the factory for the user's protection, the unit takes rugged abuse up to the critical point of overload—then instantaneously "breaks" the raising circuit of the hoist. This allows the load to be safely lowered to the floor and unhooked. Once this is done, the raising circuit of the hoist is again automatically restored.

The WRIGHT Overload Cutoff is available now as standard equipment on all new WRIGHT Frame 2 & 3 *Speedway* Electric Hoists, and as optional equipment on new Frame 1 & 1½ models.

Find out how WRIGHT *Speedway* Hoists equipped with Overload Cutoff can bring practical, fast-acting overload protection to your material handling operations. For complete information, write our York, Pa., office.

*Patent applied for

WRIGHT HOISTS

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

ACCO

. . . *when* THOMSON RIVETS

replace 4 bolts and nuts in double-tubular joints of Wallace's Fold 'n' Kot!

Wallace Products, Inc., Bellmawr, New Jersey, manufacturers of steel and aluminum products, is a long-time user of Thomson rivets for dependable fastening of portable cots and tables. Latest step in their product-improvement and cost-reduction programs was the rewarding switch from hand-applied bolts and nuts to machine-set rivets for the critical joint pictured above. The Thomson combination of tubular rivets and automatic rivet setting machines provided the superior fastening strength, assembly speed and automatic quality control inherent in riveting.

Drastic cost reductions resulted when Wallace Products switched to Thomson rivets (S-1844, 34/16") set with Thomson automatic riveting machine (Style 148).

Seventy-five years' experience in solving fastening problems is the plus you get when J. L. Thomson Mfg. Co. becomes your source of rivets and machines. More than 8,000 rivet specifications and more than 200 machine models give you standard answers to special or routine fastening requirements.

Selection of the right rivet-and-machine combination is made easy by a get-together with your nearby Thomson Fastening Man. He's listed in the Yellow Pages. Another valuable source of information is Thomson's new handbook. The coupon at right, attached to your company's letterhead, will bring it to you.

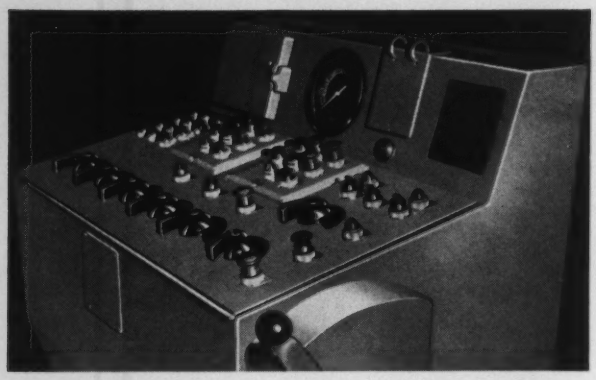
Judson L. **THOMSON** Mfg. Co.
WALTHAM 54, MASSACHUSETTS
Thomson (Canada) Rivet Co. Ltd.
Gananoque, Ontario

Judson L. Thomson Co., 424 Sawyer Rd., Waltham, Mass.

- Please rush your new handbook "Cost-Cutting Facts about Fastening with Rivets".
- Name_____ Title_____
- Company_____
- Address_____
- City_____ Zone_____ State_____

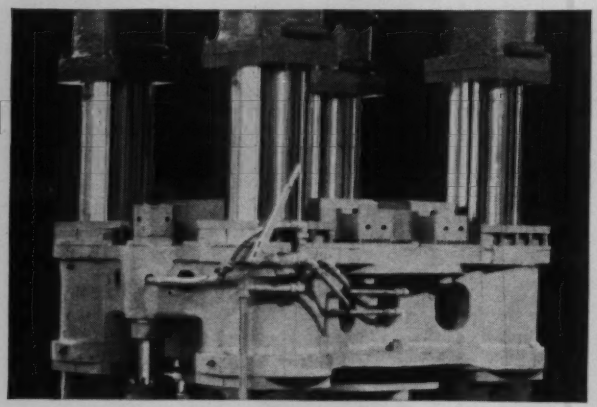
NEW YORK • ILLINOIS • INDIANA • OHIO • MICH. • PENN. • CALIF. • FLA. • TEXAS • MISSOURI • S. CAROLINA

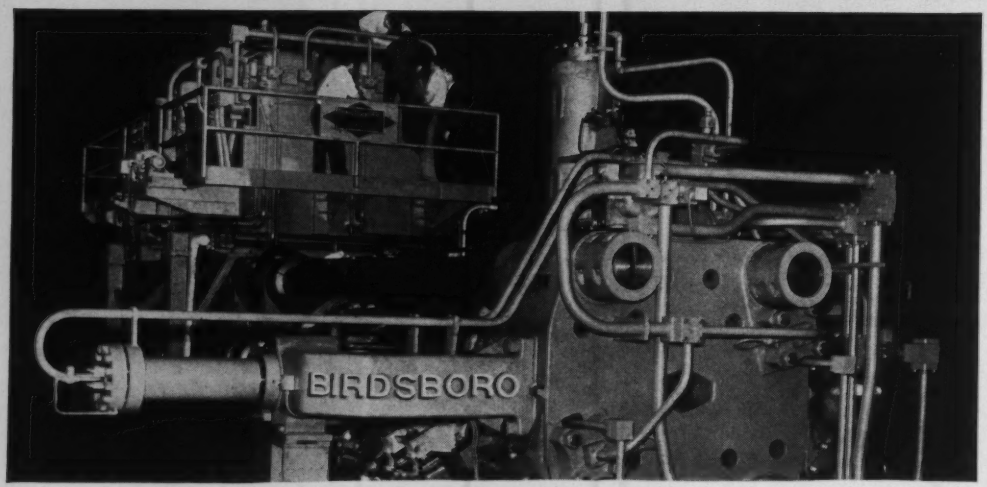
Cut your
Hydraulic Press Costs
automatically
with **BIRDSBORO**



● BIRDSBORO Hydraulic Press controls are designed to meet specific applications and future adaptions. Automatic interlocking of controls assures accurate sequence functioning of various press components — minimizes dead cycle time — minimizes expense in future operational changeovers.

Your BIRDSBORO representative can give you the details on a number of other important design features. Call him in during your next hydraulic press planning period. *Sales Department:* Reading, Pa., *Engineering Department and Mfg. Plant:* Birdsboro, Pa., *District Office:* Pittsburgh, Pa.

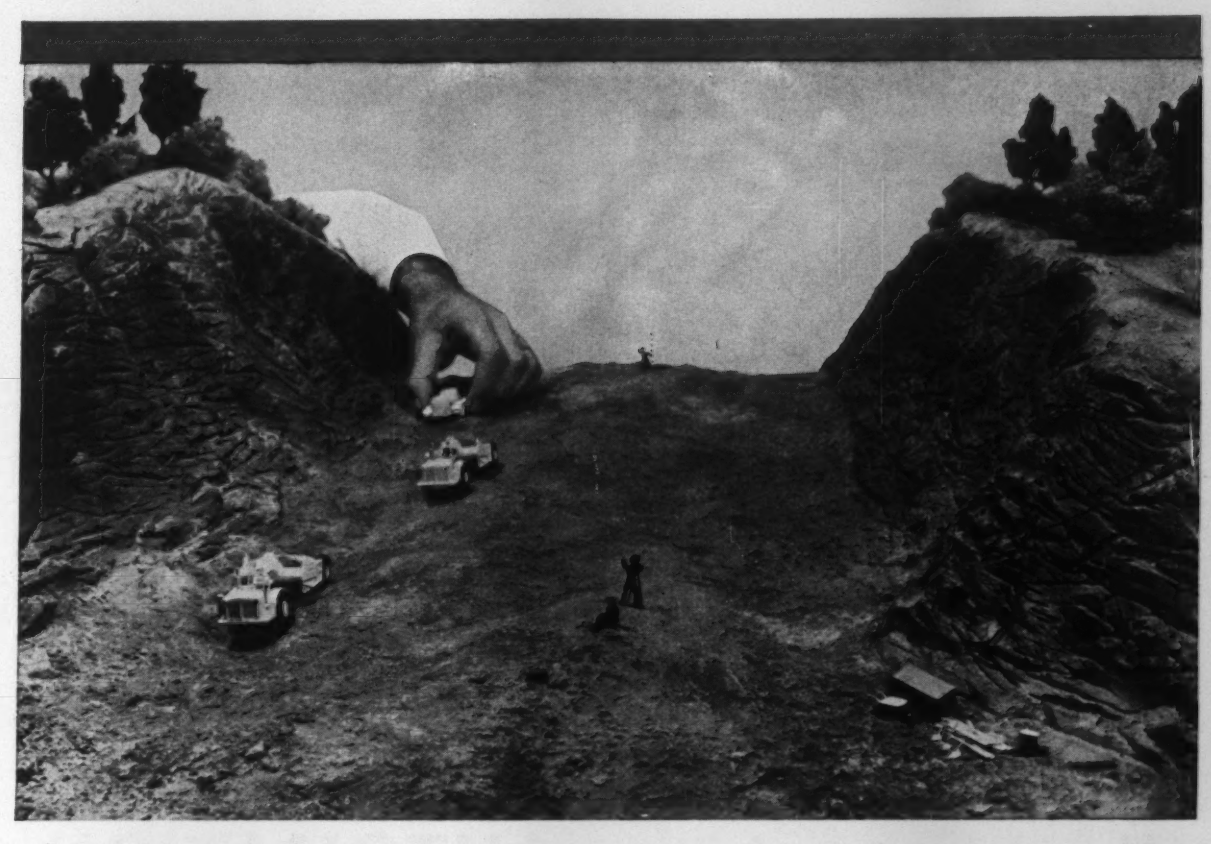




HP-42-59

BIRDSBORO
CORPORATION

STEEL MILL MACHINERY • HYDRAULIC PRESSES • CRUSHING MACHINERY • SPECIAL MACHINERY • STEEL CASTINGS • Weldments "CAST-WELD" Design • ROLLS: Steel, Alloy Iron, Alloy Steel.



Custom made for rugged service

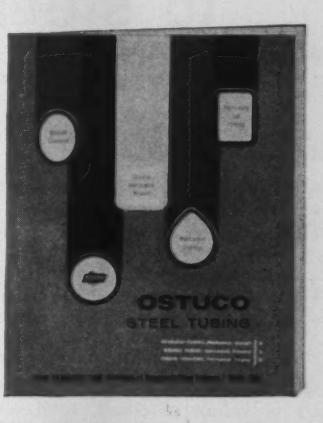
Big-job earth moving is a slamming, bruising, round-the-clock business that plays hob with construction machinery. Only the best custom-designed equipment can take the brutal punishment.

And only the finest, toughest seamless tubing can come up smiling in this rugged service. Custom quality Ostuco Tubing stands the gaff . . . fills the bill order after order.

If you're now compromising with stock tubing, consider all the advantages of custom quality Ostuco Tubing. Consistently you receive the exact tubing you want—the size, length, grade—with the strength and tolerances you need. For machined parts, you get our recommended rough size guaranteed to clean up.

With all these advantages, custom quality Ostuco Tubing is obtainable in small minimum quantities—as little as a few hundred feet. Contact your nearest Ohio Seamless representative, or the plant at Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry in America. A-1282A

Scale model illustrated built to 3.5 mm scale.



Complimentary Copy of new Bulletin CS60 "Ostuco Steel Tubing" sent on request.

OSTUCO SHELBY, OHIO

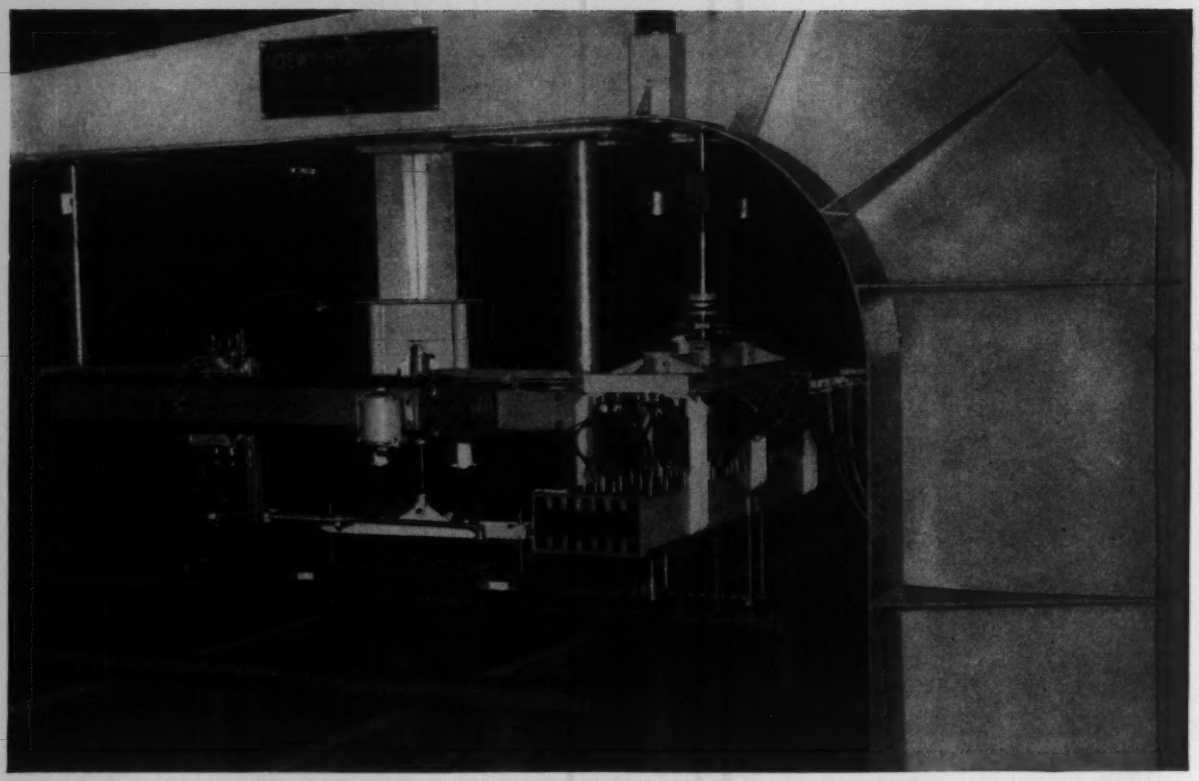
OHIO SEAMLESS TUBE

Division of Copperweld Steel Company • SHELBY, OHIO

Seamless and Electric Resistance Welded Steel Tubing • Fabricating and Forging

SALES OFFICES: Birmingham, Charlotte, Chicago (Oak Park), Cincinnati, Dayton, Denver, Detroit (Huntington Woods), Houston, Los Angeles, Miami, Moline, New Orleans (Chalmette), New York, North Kansas City, Philadelphia (Wynnewood), Pittsburgh, Rochester, St. Louis, St. Paul, Salt Lake City, Seattle, Tulsa, Wichita

CANADA: Railway & Power Engr. Corp., Ltd. EXPORT: Copperweld Steel International Company, 225 Broadway, New York 7, New York



Loewy-built automatic pipe counting, measuring, weighing, stenciling and recording machine in operation.

Now! Loewy brings AUTOMATION to steel pipe data processing!

Until very recently, steel pipe data processing demanded large crews, costly training, strict coordination, continuous supervision.

The new Loewy system, however, handles the many steps involved *automatically:*

- Weighs each pipe by means of B-L-H load cells.
- Measures pipe length.
- Stencils these variables on each pipe, in addition to fixed data, in conformance with A.P.I. standards.
- Computes weight per foot for each pipe.
- Rejects pipes out of weight tolerance.
- Indicates and prints the cumulative number of pipes, the individual and cumulative total lengths and weights, the time, the date, and pre-set data for each pipe.

Electromechanical instrumentation provides visual readouts, signals at values of count, total or individual weight or length, upper and lower limit of tolerance, or any other measured or calculated quantity. These signals may be used to operate relays, alarms, reject devices, to close down the line, to position cut-off devices, or whatever is required. And all this is done as an integral part of the mill production line.

Two of these Loewy robots are already in successful operation at a leading Midwestern steel mill, each handling 7 miles of heavy steel pipe in one 8-hour shift with ease. A third is now on order.

Close-up view of variable message stenciling section.

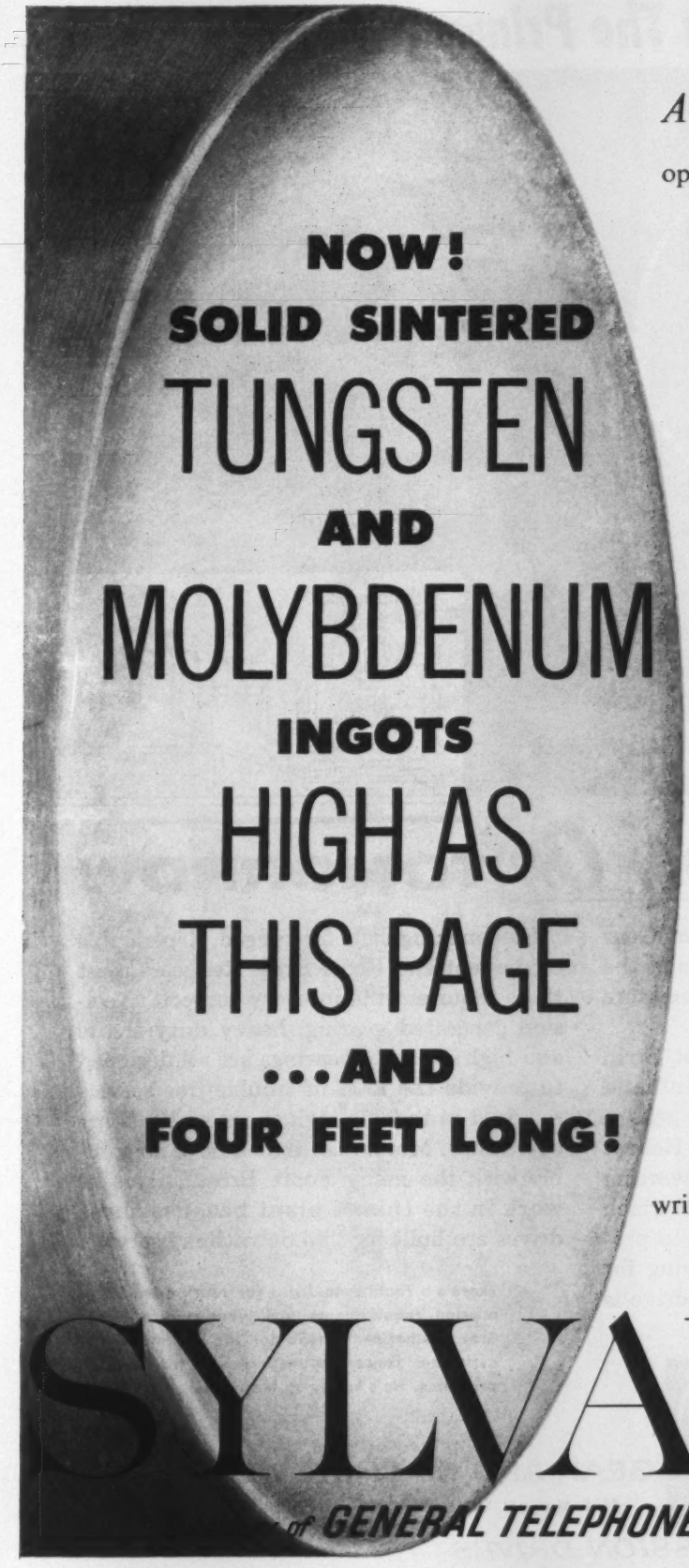
Loewy data gathering and processing equipment is not limited to tubular products. It can be used in any process which involves linear measurement, weighing, calculated quantities depending on these measured variables, automatic error-proof stenciling and printing of tally sheets, shipping information, inventories, production and incentive records, card or tape punching.

We shall be glad to explore the usefulness of Loewy pipe processing equipment for your plant. Write Dept. A-4.

BALDWIN · LIMA · HAMILTON

INDUSTRIAL EQUIPMENT DIVISION • PHILADELPHIA 42, PA.

BALDWIN BLH LIMA-HAMILTON



NOW!

SOLID SINTERED

TUNGSTEN

AND

MOLYBDENUM

INGOTS

HIGH AS THIS PAGE

...AND

FOUR FEET LONG!

Another first from Sylvania! A dramatic new isostatic pressing and sintering operation now makes it possible to supply missile and rocket makers with refractory metal ingots big enough for direct fabrication into their largest parts requirements.

By this process Sylvania can now produce 100% tungsten or molybdenum ingots up to 10" in diameter, 4 feet long! Various combinations of these elements are possible, too.

You can order ingots in a variety of sizes and shapes: rectangular, cylindrical or hollow cylinders. Special sizes and shapes are handled, too, on a special inquiry basis.

The fine grain structure achieved by this Sylvania process allows direct physical working of the material by rolling, forging or extruding.

In many cases, the smooth, clean, carbide-free surface eliminates the need for costly surface machining.

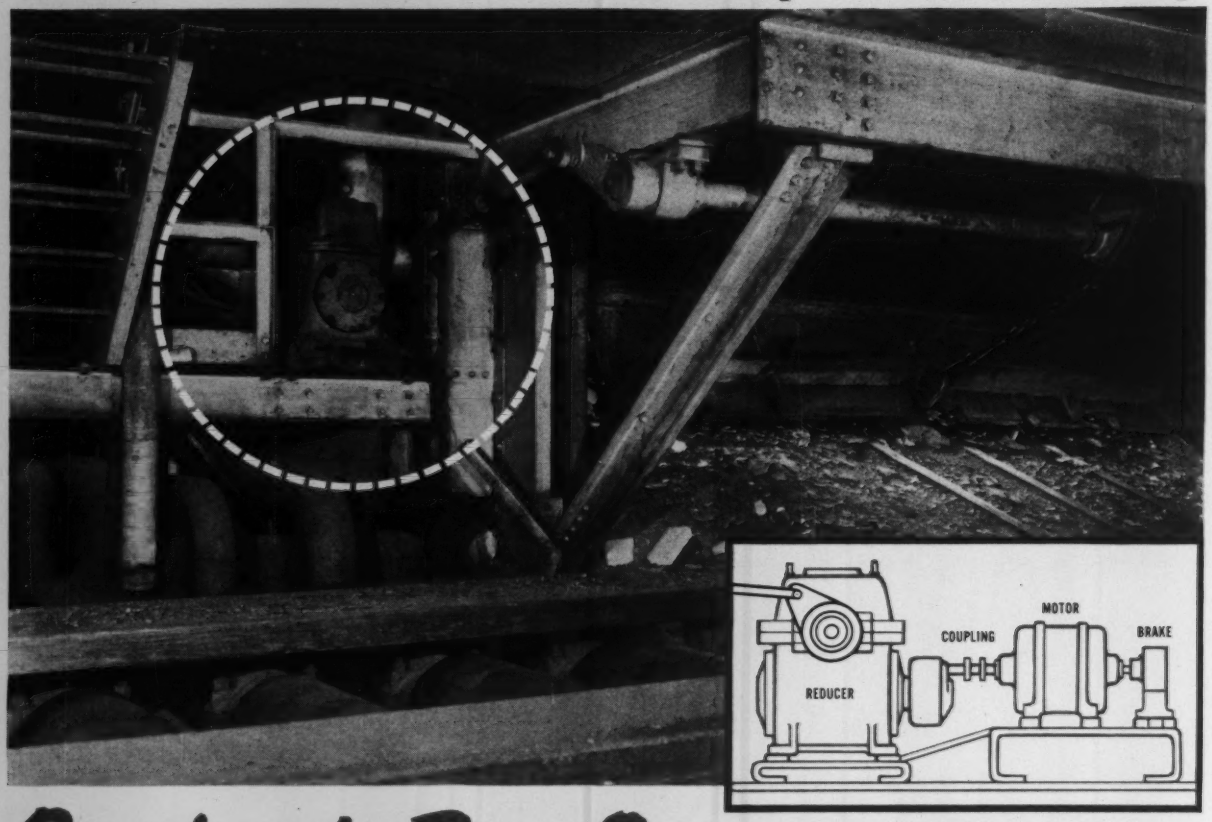
The process is relatively inexpensive, which means lower prices per pound for you over competitive processes.

If you're working with high-temperature metals requiring prefabricated ingots or consumable electrodes, Sylvania can help you. Call your Sylvania representative, or write Chemical & Metallurgical Division, Sylvania Electric Products Inc., Towanda, Pa.

SYLVANIA

of GENERAL TELEPHONE & ELECTRONICS

Foote Bros. Drives In The Primary Metals Industry



Opening the Door On TOMORROW

Every time this Foote Bros. Worm Gear Reducer operates, "tomorrow" . . . and the promise it brings of better living for more people, comes a little closer.

Installed in the modern 44" Hot Strip Mill at Inland Steel Company's Indiana Harbor plant, this Reducer opens one of two discharge doors on the No. 4 Reheat Furnace to begin the process of converting red hot slabs into coils of sheet steel which will be used by Inland's customers to produce better products for better living for more people. Another Foote Bros. drive is used to open the other door.

Steelmaking calls for rugged, dependable equipment and Foote Bros. Reducers meet these requirements in every respect. Precision generated gearing, heavy duty shafts and high capacity bearings are all designed to provide the kind of trouble-free service required in today's high speed steelmaking operations. Maintenance men have no trouble with the many Foote Bros. Drives at work in the Inland plant because these drives are built for "no downtime" service.

There's a Foote Bros. Drive for your power transmission requirements. Ask your nearby Foote Bros. Authorized Distributor for information or assistance concerning your power transmission problems. He's ready to help you.

FOOTE BROS. GEAR AND MACHINE CORPORATION

4565 South Western Boulevard, Chicago 9, Illinois

POWER TRANSMISSION DRIVES

NOW AVAILABLE!

ELECTRONIC INDUSTRIES Marketing Map

A distribution of electronic plants in the United States on a county basis

exclusive

Marketing Map of the United States

showing

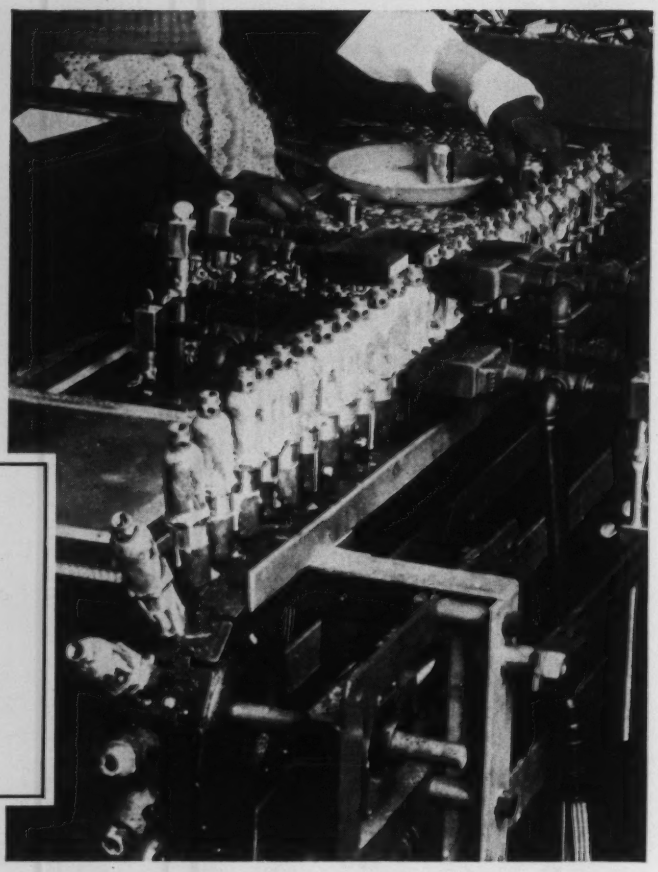
- *Distribution of electronic plants in the United States on a county basis*
- *Detailed breakdown of 8 major metropolitan areas*
- *Distribution of plant locations & electronic engineers in major states*
- *4 color codes indicating number of plants by county*
- *Suitable for framing and wall mount*
- *52 x 33 inches in size*
- *Orders filled and mailed same day*

QUANTITY IS LIMITED—ORDER YOURS TODAY

Prices:

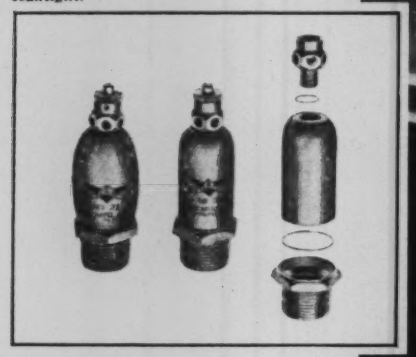
Individual copies mailed in tubes	$3.50 each
2 to 25 copies	3.50 each
26 to 100 copies	3.00 each
More than 100 copies	2.50 each

Please make checks payable to ELECTRONIC INDUSTRIES and mail to Market Research Department, ELECTRONIC INDUSTRIES, 56th and Chestnut Streets, Philadelphia 39, Pennsylvania.



Operator dips parts in HANDY FLUX and assembles them with EASY-FLO 45 rings on a moving rig. Assemblies then pass between banks of gas burners to complete brazing process. Capillary action of EASY-FLO brazing alloy insures thorough penetration—guarantees high strength, leakproof joints.

Flair No. 21 Hot Water Air Vent consists of the basic free-venting air valve, a generous air-collection chamber and a massive hex base. Two preform rings of EASY-FLO 45 are used in the brazing operation. Valve assembly at left was subjected to extreme pressure. Note how body ballooned; joints strong and leaktight.



How Flair Manufacturing Speeds Production, Eliminates Costly Casting With Easy-Flo Brazing

Never a field failure in any joint brazed with EASY-FLO 45 and HANDY FLUX—that's the proud record of Flair Manufacturing Company, Brooklyn, New York, makers of an extensive line of air valves and other specialties for steam and hot-water systems.

Flair finds that brazing with EASY-FLO 45 offers competitive advantages in every aspect of design, production economy and service life. Big savings are made through elimination of costly casting equipment and more productive use of space. Production is smoother, faster. Valves look better, last longer... in tests to 5000 psi, valve bodies burst while brazed joints remain intact. All this for an alloy cost per unit of approximately 2½¢ for two preform rings of EASY-FLO 45.

Speed, strength, economy, low labor costs—advantages *any* manufacturer would be glad to have. And, all achieved through use of Handy & Harman silver alloy brazing. Chances are silver alloy brazing could benefit your product too. If it could, or if you think it *might*, don't hesitate to get in touch with Handy & Harman. We'll help you in every way possible. Why not call us today?

DON'T MISS OUT . . .
on Handy & Harman's new silver alloy brazing Correspondence Course. Designed to put *all* the facts and techniques at your fingertips, this course is invaluable to everyone concerned with silver alloy brazing. Send for "Training Course Prospectus."

Your No. 1 Source of Supply and Authority on Brazing Alloys

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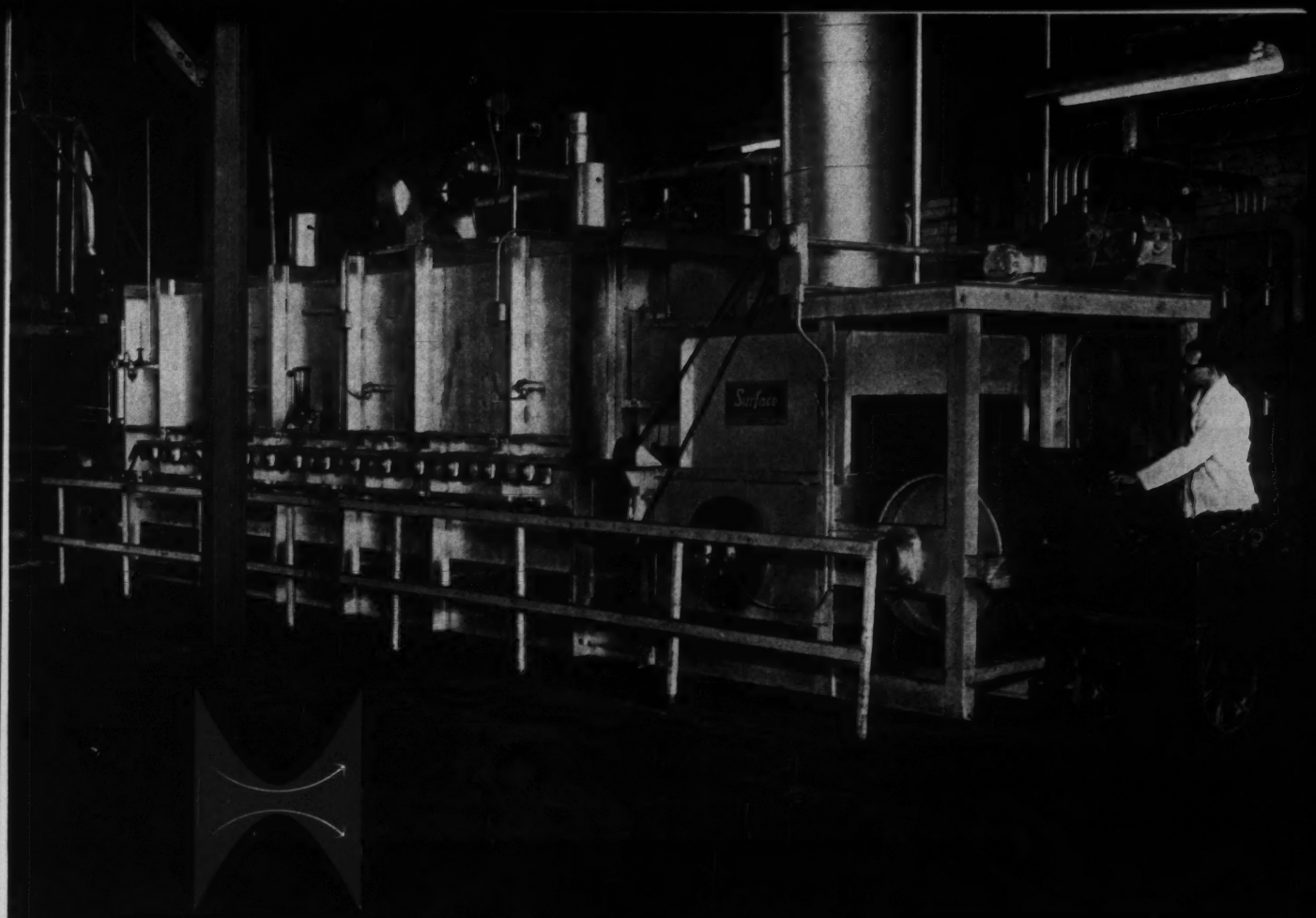


SURFACE POWER CONVECTION EQUIPMENT cuts Ross Gear forging process time 50%

High speed, high volume air circulation is the feature of this Surface continuous draw furnace, which enabled Ross Gear and Tool Company, Lafayette, Indiana, to

(1) process a wide variety of steering gear forgings much faster than with the batch type furnaces replaced. These forgings range from a few ounces to 22 pounds.

(2) draw forgings at rates to keep up with production in hardening operations.

(3) reduce handling operations, consequently reassign personnel to more productive jobs.

The furnace has three separately controlled zones, each with its own burners and fan. The uniformity of furnace temperature from zone to zone is consistently held within $\pm 5°F$.

Mr. Leonard Ewalt, Chief Metallurgist of Ross Gear, reports: "The furnace will heat through a 2-inch section in approximately 40 minutes—just about as fast as the metal can take it when heated by convection . . . I would say that with this method of distributing heat in the zones and the rapid heating rate, this Power Convection furnace* is a couple of years ahead of its time.

We're not waiting for tomorrow, either. We're getting results today."

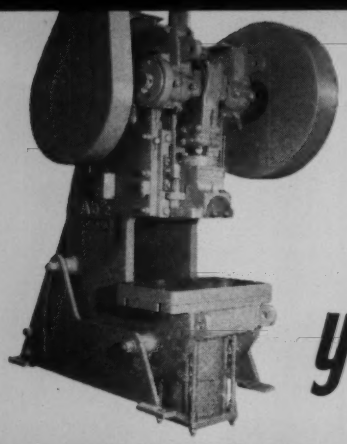
Write for bulletin SC-182. Surface Combustion, 2373 Dorr Street, Toledo 1, Ohio. In Canada: Surface Industrial Furnaces Ltd., Toronto, Ont.

*Trademark of Surface Combustion, Division of Midland-Ross Corp.

Surface

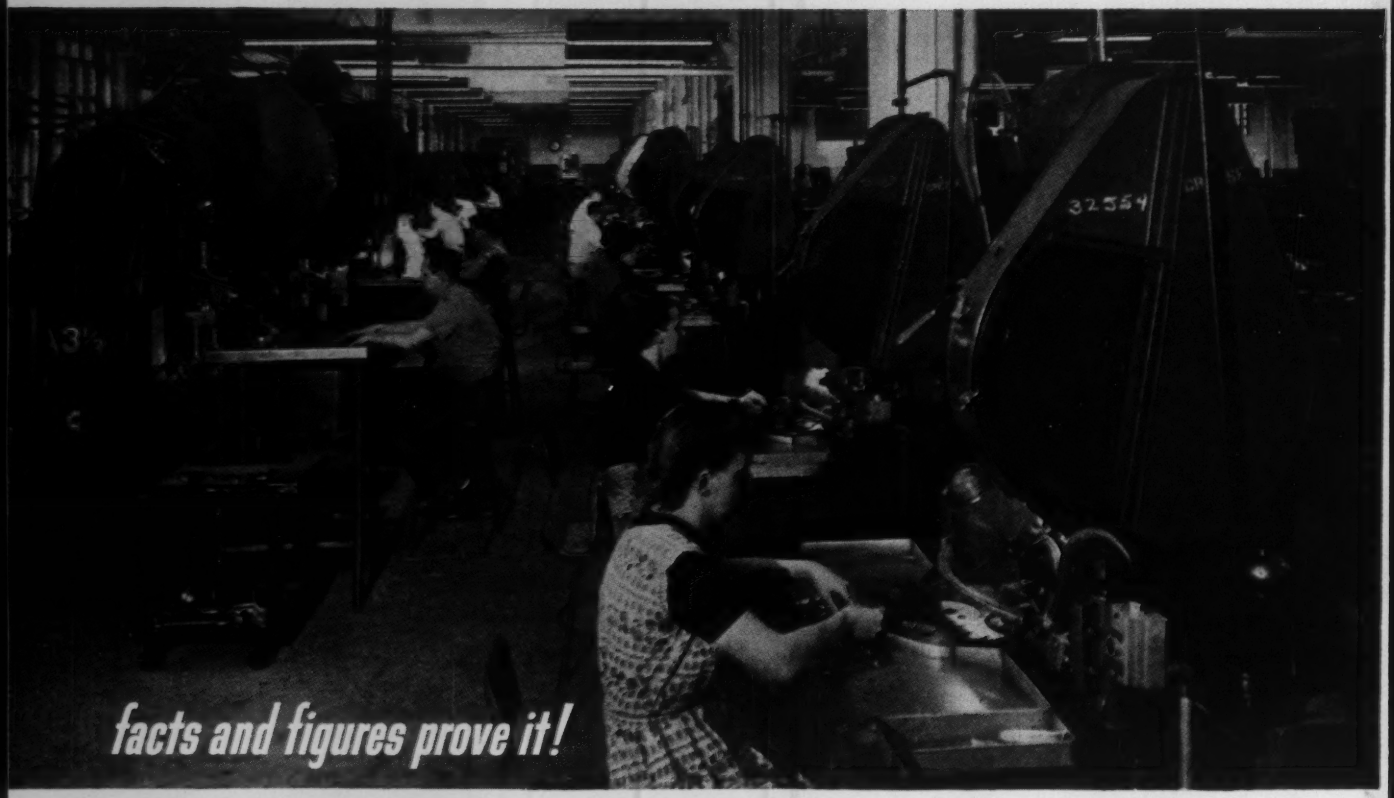
A division of Midland-Ross Corporation

M-R



MMT-PE
MODERN MACHINE TOOLS
PRODUCTION EFFICIENCY

for grass roots economy you just can't match this OBI



facts and figures prove it!

Cold, hard statistics leave no doubt. Wherever performance data and cost records are compared, the Series A Inclinable is way out front in parts produced per dollar expended.

On the most demanding jobs . . . where the clutch is engaged and disengaged at every press stroke . . . where three-shift operation continues day after day . . . *no OBI can even approach it in thrifty operation, fool-proof simplicity, and safety.* Readily understandable are the reasons why:

Niagara's famed, multi-point mechanical sleeve clutch picks up the load on 14 engaging jaws, applying the driving force concentrically without keys or pins. Instant engagement and maximum productive strokes per minute are assured.

There are no complicated electrical circuits, relays, limit switches or solenoids . . . no palm buttons, air valves or rotary air connections. In fact no air is consumed.

With fewer parts and simpler construction, there's less to go wrong, less to repair or replace. As a result, this is not only a more economical press to operate, but a much safer press as well. Records of thousands of presses are factual proof that the Niagara mechanical sleeve clutch is unequaled in safety and reliability.

Built in 13 standard sizes, with shaft diameters from 1¼" to 6½" and capacities from 5½ to 190 tons, Niagara Series A Presses can be readily equipped with numerous accessories for individual requirements.

GET THE FACTS AND FIGURES. WRITE FOR NEW BULLETIN 58N

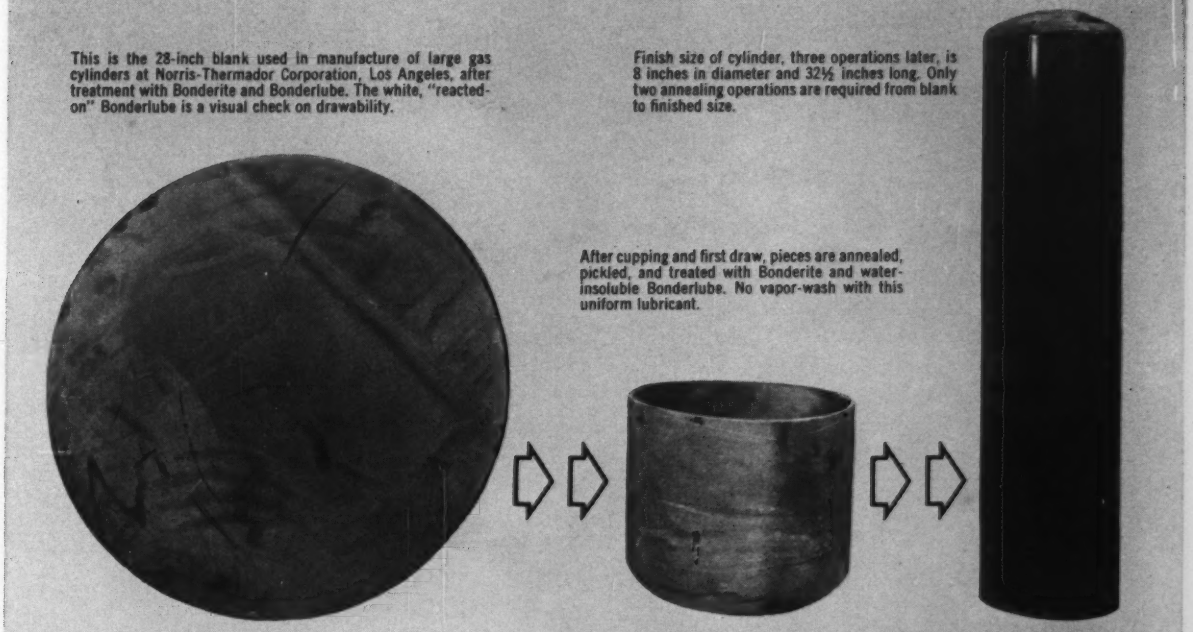
NIAGARA

NIAGARA MACHINE AND TOOL WORKS • BUFFALO 11, N. Y. District Offices and Distributors Everywhere

This is the 28-inch blank used in manufacture of large gas cylinders at Norris-Thermador Corporation, Los Angeles, after treatment with Bonderite and Bonderlube. The white, "reacted-on" Bonderlube is a visual check on drawability.

Finish size of cylinder, three operations later, is 8 inches in diameter and 32½ inches long. Only two annealing operations are required from blank to finished size.

After cupping and first draw, pieces are annealed, pickled, and treated with Bonderite and water-insoluble Bonderlube. No vapor-wash with this uniform lubricant.



Increased production at lower costs, real savings with BONDERITE and BONDERLUBE in cold drawing

The press room at Norris-Thermador, Los Angeles. (Photos courtesy Norris-Thermador Corp.)

In heavy drawing operations like those illustrated, high lubricant film strength is vital. BONDERITE, an integral phosphate coating on metal, and BONDERLUBE, chemically combined with the BONDERITE coating, produce an unexcelled, tough film that continues to act as a separating layer even when the surface area worked is increased several times.

This tough integral film moves along with the metal surface. So, you can get greater reductions, use double pass operations and can produce millions of parts without change in your die setup. Results are expanded press productivity and real cost savings.

A further, major source of savings is the reduction in number of necessary process anneals, substantially decreasing handling, pickling and relubricating costs. Even better, with reactive BONDERLUBE, lubricant costs are frequently reduced to a fourth of the former cost.

AIDS ANY SEVERE IRONING OPERATION

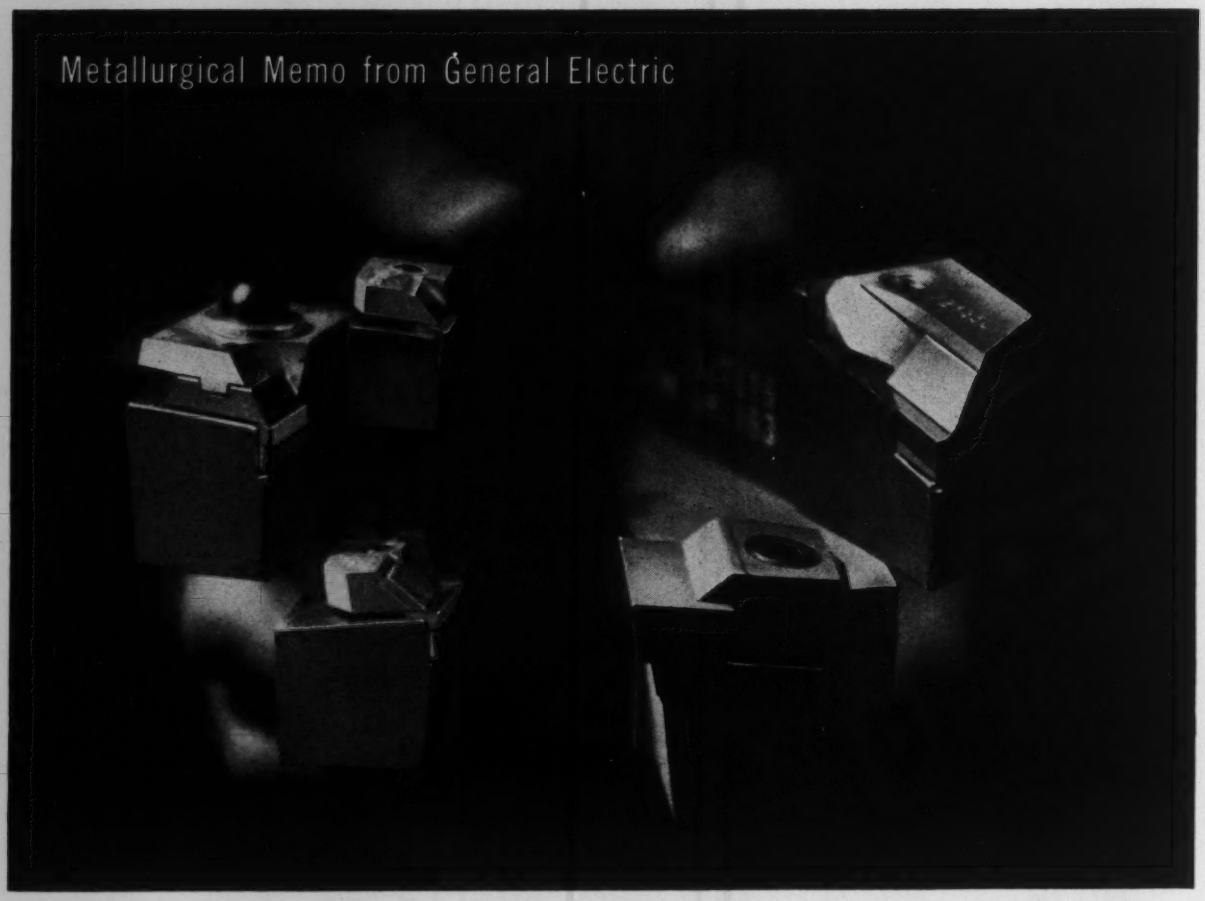
If you draw tubing, wire, bumper bars, frame members, motor mounts or do other severe drawing operations on steel plate, BONDERITE and BONDERLUBE will lower forming costs in your plant. Parker's staff of specialists will be sure you get the right combination to raise production and save you money. Write us today.

Parker Rust Proof Company
2197 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE corrosion resistant paint base • BONDERITE and BONDERLUBE aids in cold forming of metals • PARCO COMPOUND rust resistant • PARCO LUBRITE—wear resistant for friction surfaces • TROPICAL—heavy duty maintenance paints since 1883

Since 1914—Leader in the field

*Bonderite, Bonderized, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.



Pick the one you need . . . there's a G-E Carboloy® toolholder for every metalcutting purpose

Designed to do a better job more efficiently, Carboloy toolholders help you get BETTER PROFITS THROUGH BETTER TOOLING

Even the very finest cemented carbide inserts (Carboloy carbides) can't do a decent machining job if the toolholder is inferior.

That's why the Metallurgical Products Department of General Electric has evolved a line of toolholders to do a superior job in every metalcutting operation. Carboloy toolholders get the mileage out of inserts . . . take the headaches out of machining.

Choose from: Lift-O-Matics, with self-raising chip-breaker clamp (positive rake, negative rake – 20 styles, 186 sizes total); Adjust-O-Breakers, with the chip-breaker versatility of *many* toolholders (negative rake – 10 styles, 30 sizes); Tracers (positive rake, negative rake – 8 styles, 19 sizes total); Heavy-duty (8 styles – 10 sizes).*

These, along with the complete line of Carboloy inserts, insert seats, convertible seats, and brazed tooling, are all designed to help you attain "BETTER PROFITS THROUGH BETTER TOOLING." Check with your Authorized Carboloy Distributor today. Or write: *Metallurgical Products Department of General Electric Company, 11153 E. 8 Mile Street, Detroit 32, Michigan.*

**Available through Canadian General Electric Company, Limited, Toronto, Ont., and through International General Electric Company Division, General Electric, International, New York, N.Y.*

CARBOLOY®
CEMENTED CARBIDES

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GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

SAGINAW ball/bearing SCREW

A rugged Saginaw Ball Bearing Screw is used to raise and lower the new "Jetway" passenger loading corridor, manufactured by P I Steel Corporation in Los Angeles. It's now in operation for United Air Lines at San Francisco and New York's Idlewild Airport. These movable, telescoping corridors directly connect terminal and aircraft. Travelers pass through, protected from wind, rain, fumes and noise.

The Saginaw b/b Screw used here is a standard rolled thread assembly with a B.C.D. of three inches and measuring seven feet in length. The Saginaw Screw is in a motor-driven shaft under the outboard section of the "Jetway" . . . and in seconds, smoothly and accurately matches the floor elevation of the huge corridor to that of the plane.

Airlines specifically avoided hydraulic elevating systems—the Saginaw b/b Screw was selected because it converts *rotary* motion into *linear* motion with *over 90% efficiency*, plus contributing important savings in maintenance and power and providing noise-free operation. The Saginaw b/b Screw may bring these and other profitable benefits to *your* product, too. Details are yours by phoning or writing Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Michigan—*world's largest producers of b/b screws and splines.*

Lifts giant "TRAVELING" corridor

Actuation To Fit Your Individual Requirements

Have been built as small as 3/16 in. B.C.D. and 3/4 in. long, as large as 6 in. B.C.D. and 40 ft. long. Larger sizes can be built to your order.

Saginaw ball bearing Screw

WORLD'S MOST EFFICIENT ACTUATION DEVICE

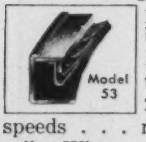
ENGINEERED OIL SEALS for Steel Mills

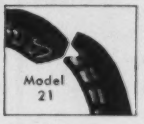
Garlock KLOZURE Oil Seals protect vital bearings from damage, add to efficiency of new Jones & Laughlin punch card-operated continuous mill at Aliquippa, Pa.

Jones & Laughlin Steel Corporation specifies Garlock KLOZURE* Oil Seals to protect important bearings on new punch card-operated mill at Aliquippa.

At dozens of vital locations on the 44" 4-Hi Continuous Mill—approach and runout tables, vertical edgers, coilers, rotary crop shears—the Garlock KLOZURE Oil Seals perform a double duty. They stop leakage of lubrication from the bearings, prevent harmful scale, spray, dirt from getting to the bearings.

In wide use today throughout the steel industry, Garlock KLOZURE Oil Seals are available in a wide range of designs. For example, Model 142, a face-type KLOZURE, is designed to seal surfaces perpendicular to shaft . . . keeps water splash and scale out of bearings at the shoulder of mill rolls. Models 64 and 82 are applied to large shafts at normal or high speeds . . . ideal for protecting bearings on back-up and work rolls. Model 53 withstands temperatures up to 250°F at normal or high speeds . . . recommended for table rolls. Where equipment can't be dismantled easily, Models 21 or 23 Split-KLOZURES are the choice.





Like Jones & Laughlin, many of the large steel producers are enjoying the advantages of Garlock KLOZURE Oil Seals. For instance, all KLOZURES are oil and grease resistant . . . impervious to water, mild acids, alkalies . . . non-abrasive . . . withstand temperatures from −40°F to +250°F. For extreme conditions, Garlock furnishes sealing elements resistant to practically any fluid, and serviceable as high as +500°F.

Enjoy these same benefits. Talk to your local Garlock representative about high-quality KLOZURE Oil and Grease Seals. Call him at the nearest of

GARLOCK

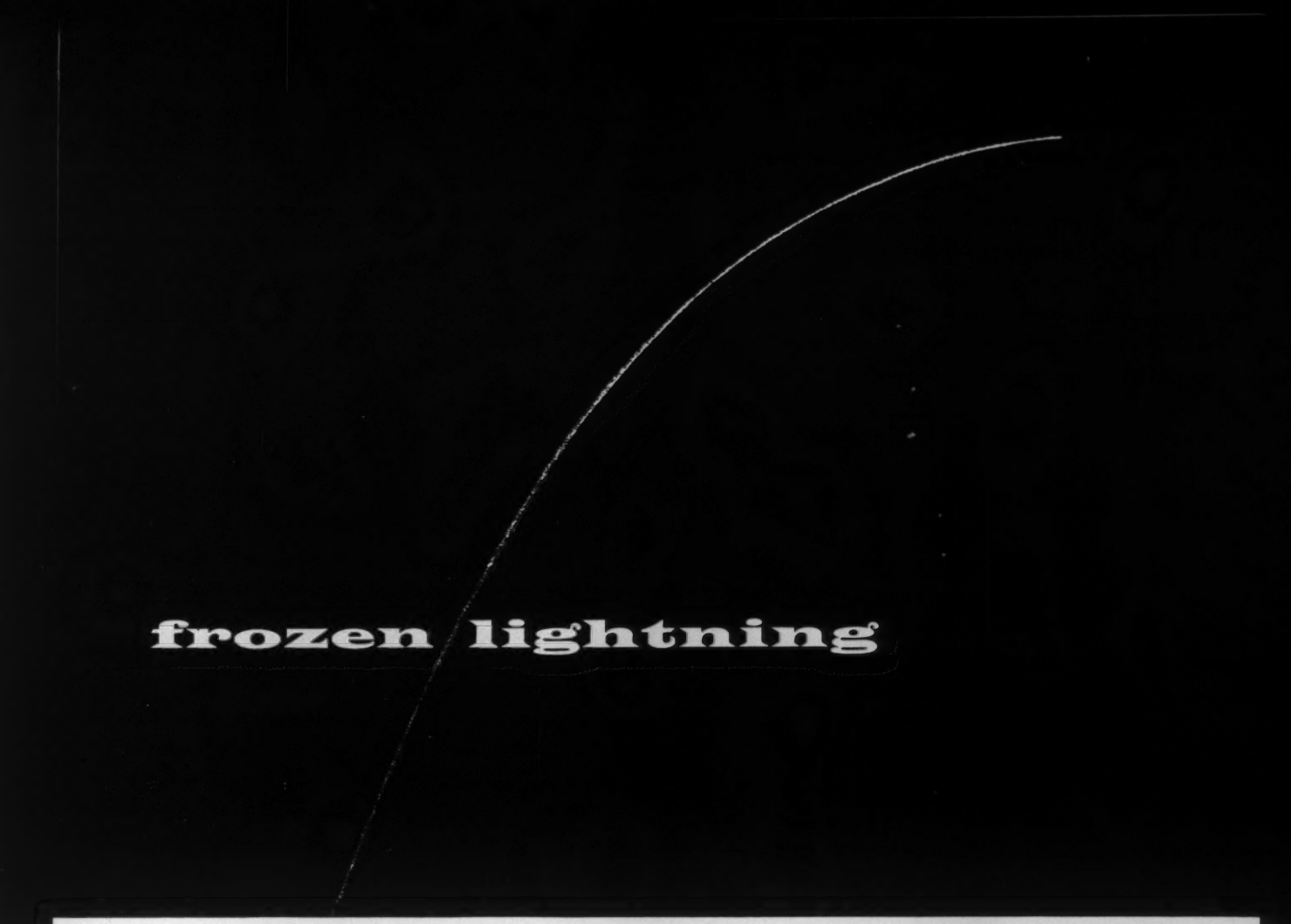
Garlock's 26 sales offices and warehouses throughout the U.S. and Canada. Or, write for KLOZURE Catalog 30. The Garlock Packing Company, Palmyra, N. Y.

Canadian Div.: The Garlock Packing Company of Canada Ltd.

Plastics Div.: United States Gasket Company

Order from the Garlock 2,000 . . . two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*Registered Trademark



That's what the Germans call the stratosphere trails of high altitude rockets. Soon, Mach 4-5 aircraft will be cutting frozen lightning trails across our own skies. Structural parts of hypersonic aircraft and missiles must function perfectly at temperatures too high for ordinary alloys.

The answer lies in predictable performance Carpenter alloys made by the exclusive Mel-Trol®, VacuMeltrol®, and Consumet® melting processes. Engine builders find them ideal for many critical parts. Forge shops report improved forgeability resulting in better finishes requiring far less machining . . . fewer rejects.

For the whole story about Carpenter predictable performance high temperature alloys, call your local Carpenter Representative or write: The Carpenter Steel Company, 121 W. Bern Street, Reading, Pa.

Carpenter steel

The Carpenter Steel Company, Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N.J.
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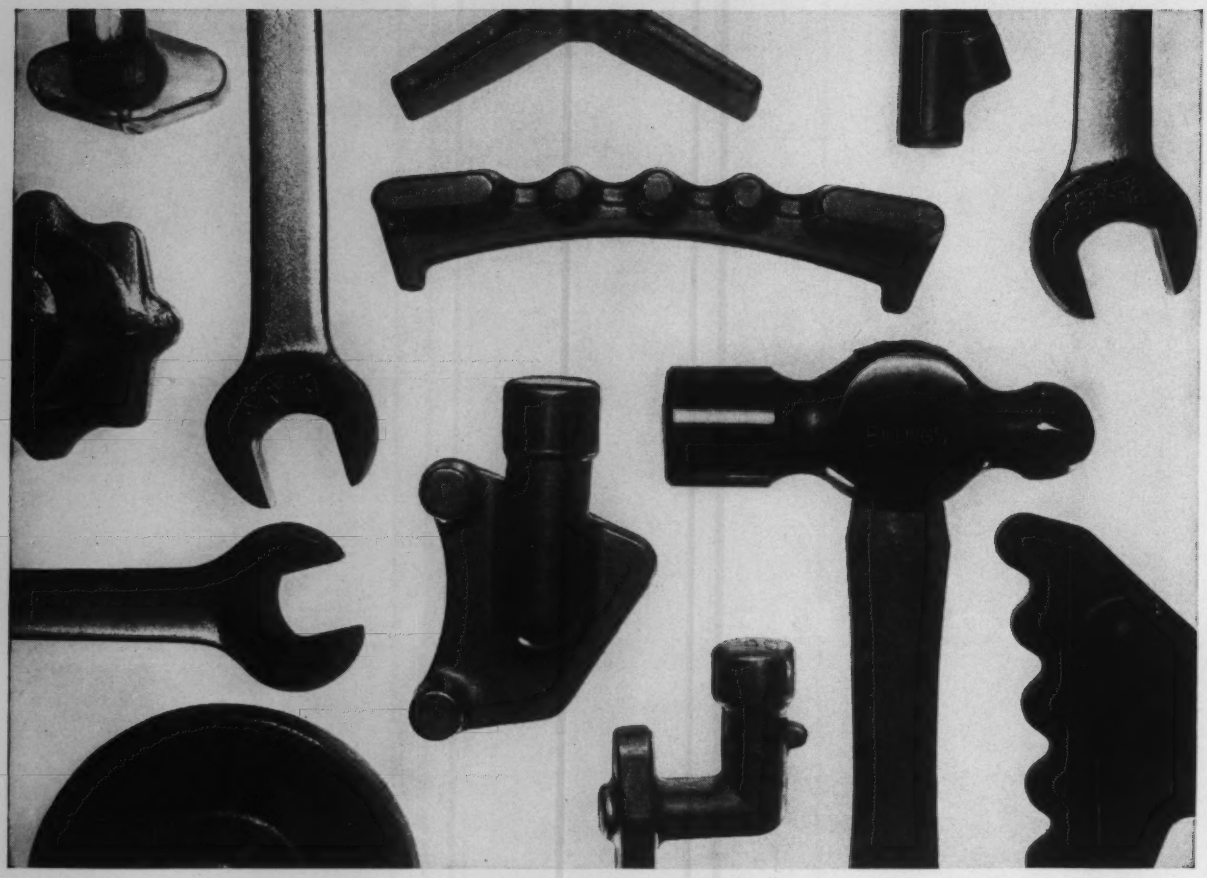
Carpenter Steel of New England, Inc., Bridgeport, Conn.

a new company 70 years old



The Billings & Spencer Co. produces hundreds of quality forgings daily—from aircraft and missile parts to hand tools. Speedomax H temperature control helps hold rejects to a minimum.

Control of forge fires improves profitability...

. . . at The Billings and Spencer Co., Hartford, Conn., where Speedomax® H controllers are providing the right temperatures for a variety of forgings, ranging from mechanics' hand tools of carbon and low alloy steels, to aircraft and missile parts made of today's modern high temperature alloys. The combination of precise temperature control, good furnace design and good forge-shop practices has not only reduced rejects . . . it has saved fuel and greatly improved furnace life. Rugged, compact and completely reliable, Speedomax H is providing similar benefits for numerous other heat treat operations . . . is helping both to modernize production, and to produce a quality product. *Whatever your heat treat, it'll pay you to investigate Speedomax H!* For details, contact your nearest L&N office, or write 4956 Stenton Avenue, Philadelphia 44, Pennsylvania.

Unaffected by either high ambients or continuous vibration, Speedomax H provides dependable, uninterrupted regulation of forge temperatures.

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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

PRICE WEAKNESS IN BASIC COMMODITIES is spreading out. You won't notice it in list prices, but it does crop up in discounts, extras, extra services and the like. It means that competition for business is stiffening all along the line, and that the time of the real hard sell is not coming, it's here.

IN SPITE OF DISCOURAGING TALK ABOUT EXPORTS, many metalworking companies are increasing their overseas markets. It does take specialized knowledge and some effort, but companies who take the initiative find a good demand for U. S. products in world markets.

PACKAGING ADVANCES ARE COMING FAST in an industry called on to put more sell into wrappings. Competition among materials for a bigger share of the market was highlighted at recent National Packaging Exposition. Aluminum companies predicted growing use of their product for packaging. Gains are expected in applications of aluminum cans, foil, and foil-polyethylene combinations.

SPACE SPENDING WILL SOAR, according to experts. The estimate is that learning about space will cost us at least $15 billion over next ten years. While present spending rate is just under $1 billion a year, this rate will move over that mark in fiscal 1962--and will continue to climb in each succeeding year.

RELUCTANCE OF PURCHASING AGENTS TO ADD TO INVENTORY has been examined by the National Association of Purchasing Agents. Responses from the purchasing men showed three major factors for their reluctance: Ready availability of all materials, belief that prices will not rise much in the months ahead, and fact that purchasing executives and top managements are more aware than ever of the high cost of carrying material in stock.

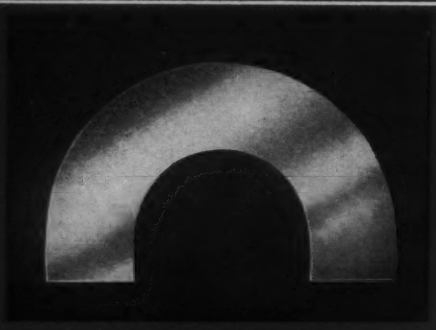
CANADA FORECASTS RECORD CAPITAL EXPENDITURES in 1960. Breakdown of the government forecast of $8,770,000,000 shows new construction at $5,942,000,000, up 2.5 pct over 1959 outlay; and new machinery and equipment, $2,828,000,000, up 8.2 pct over last year. Says Bank of Montreal: "The heavy emphasis on machinery and new equipment . . . may well result in higher imports in certain categories."

COMPACT CARS SHOW SALES STRENGTH. Compacts accounted for 24 pct of January-March production; 31 pct is scheduled share for April-June.

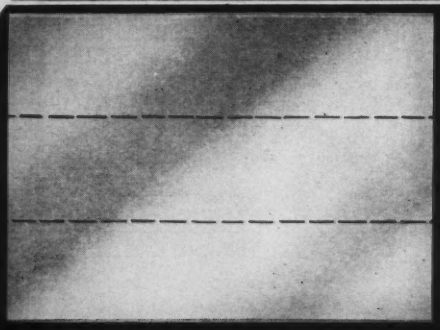
*$100.00 per part production SAVINGS.....

...with the BATH METHOD

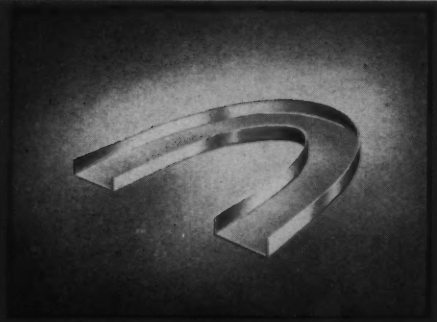
OLD METHOD



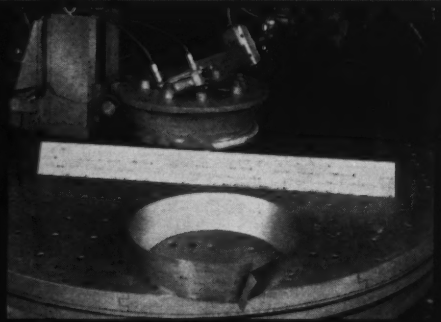
Cutting out the blank in this titanium piece was [illegible]



3 titanium parts per piece instead of one.



Drop Hammer operation resulted in heavy scrap loss.



Radial Draw Forming prior to Drop Hammer operation eliminated metal distortion, greatly reduced rejects.

Finished part

Finished part

*The illustrated titanium part was not only expensive to make by old methods, but because of metal distortion, the part reject loss was tremendous. By STRETCH RELIEVING the titanium, using a Bath Radial Draw Former, part rejects were practically eliminated . . . in short, a method of forming shapes that keep their shape . . . even after heat treating . . . *Send for the plant facilities folder, it illustrates both the standard Radial Draw Forming facilities, plus a completely new series of HIGH SPEED production forming machines.*

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Export Markets Aren't Dead

But Selling Abroad Takes Planning and Effort

It's easy to say that U. S. companies are pricing themselves out of world markets.

But companies who take the initiative can expand export sales.

In a competitive market, export may make the difference between profit and loss. — By K. W. Bennett and T. M. Rohan.

▪ Many businessmen believe the market for U. S. products abroad is dead, or dying. We're being priced out of every world market, they say.

Here are a few people who hadn't heard. Ace Fastener Co., medium-sized Chicago manufacturer of staplers and stapling equipment had a record export year, on top of an export history dating back to the '30's, in 1959.

They'll do better this year. The company is currently making its first shipments to Finland, Denmark and is moving into Saudi Arabia. 1960 will be another record year, according to export sales manager Charles Hofstetter.

More Examples — Kester Solder Co. boosted export sales 30 pct in 1959. The company produces solder and fluxes, has sold in export for 15 years. The firm shipped to 50 countries last year, is opening new markets in Africa and Asia. It is shipping specialty items into the teeth of foreign competition, to customers in Great Britain and Germany, according to export manager R. E. Kilpatrick.

Duro-Metal Tools Company is not a corporate giant. It produces hand and woodworking tools. Much of its line of small tools is not covered by patent. This company "wouldn't have a chance trying to export its product" pessimists theorize.

But Duro-Metal will boost its export sales in 1960 by a conservative 5-10 pct, according to export chief John Gracious. It's opening new Scandinavian markets, already ships tools to buyers in Africa, Europe, and Asia.

Defy the Experts—How bad is the export picture? The three companies cited are not large, ship items already manufactured abroad and sold at or under U. S. price, but they still have a rosy export outlook. This is directly at odds with the views of experienced export firms who say U. S. exports are already in trouble and will get worse.

These aren't isolated examples in the Midwest, which is becoming more and more export-conscious. A foundry machinery maker has opened an excellent market in Japan. An exporter is shipping home-laundry equipment abroad with a 26 pct sales boost in 1959;

Will Export Sales Rebound?

he also markets trucks abroad, and will score increases there.

To get on his client list, a company must do $50,000 in export business annually—as a starter. An office equipment manufacturer with a single 50-man plant, ships office furniture to the Far East. His customers waited three months to get American-built desks when the steel strike forced him to shut down temporarily.

Conference Highlights — A packed World Trade Conference in Cleveland last week also underscored the importance of world markets to the industrial Midwest.

Some key points brought out:

The European Common Market is expanding and accelerating much faster than expected and duties are being reduced.

Final figures on the St. Lawrence Seaway, which many believed was a dud in its first year of operation, showed things weren't as bad as reported.

But the U. S. good will in South America is evaporating rapidly in spite of President Eisenhower's visit.

Imports are not growing as fast as the U. S. gross national product and are becoming a necessity for expansion.

S. J. Rundt, New York export consultant, pointed out the importance of export in a competitive economy.

"There is little doubt that there is a showdown in store for U. S. firms now," he said. "They may find suddenly that the 5 or 6 pct export they are doing is the difference between black and red ink, and the export manager will suddenly become a gentleman."

Seaway Fares Well—On the St. Lawrence Seaway, the audience was surprised to hear that 2½ tons went out for every ton that came in, according to W. H. Crosswhite, traffic service officer.

He attributed early mixups last year to a three-week longer-than-normal winter, a congestion of over 100 ships at the mouth waiting to get in, and inexperience of locks operators.

It would be foolish to call export sales an easy bonanza. But its equally off-target to give up export just because trade gossip says exports sales are tough.

Problems—Here are the arguments you'll hear:

(1) A small firm can't go into export. Large American corporations have over $50 billion in manufacturing facilities abroad. They'll build equipment in that market, undersell the little manufacturer who still builds in the U. S.

(2) If you aren't covered by patents, your product will be swamped by cheap, foreign trade copies, as soon as you've developed the market.

(3) Export sales require a great deal of red tape. Selling costs are high, profit margins are low.

(4) U. S. prices are still rising. Foreign prices are low. You face a growing pricing problem.

Solutions — And here's how the small firms who make a good thing of export get around these problems:

If you are too small to hire an export sales manager, hire an export-import agency. He'll evaluate your product, give you some ideas of what to expect. If he's a good one, he'll handle all the paper work. Give him at least one year to develop your product.

If satisfied with the first-year results, expect substantial gains in the second and third years as he learns more about the behavior of your product abroad. If he doesn't pull up sales again in the second and third year, find another broker.

Second, assign one man to handle your export-import paper work. He needn't be a salesman. Merely someone who will become familiar with paper work. Exporters report this is a major problem, particularly in the Midwest. In one case, it took three weeks to get a packing list and inspection certificate.

Most firms would pack these with domestic shipments as a matter of course. A major airline persists in

Straight Talk on Exports

Sec. of Commerce F. H. Mueller Comments:

● **"An upsurge of productivity and prosperity abroad has created fresh opportunities for new and enlarged markets. . . . American business would be in a sleep worse than Rip Van Winkle if it fails to stay wide awake to these increasing sales opportunities."**

● ***"Industrial production in W. Europe last year was about 10 pct higher than a year ago, and the increase in Japan amounted to about 30 pct over this same period. Production, consumption, and investment in these countries are currently at record highs and are rapidly expanding."***

● **"For the first time in history, many European workers are in the middle class income bracket and no longer spend solely for minimum food, shelter, and clothing. They have money for discretionary purchasing. They need more, want more, and buy more."**

● ***"With the assistance of the General Agreement on Tariffs and Trade and the International Monetary Fund, we have made much progress already in getting rid of restrictions that adversely affected our exports."***

● **"Improvement and expansion in practical assistance to American business abroad will be (included) in the Foreign Service. The State Dept. plans to more than double the number of its commercial attaches."**

sending its bills in one copy, rubber stamped. The bank won't accept this, wants the bills in duplicate and signed by hand.

Export brokers report that declarations are lost repeatedly, even though the broker religiously sends the declaration to his manufacturer-client with each sales order.

Keep Trying — If your export broker tells you your product won't sell in a foreign market, get the opinion of other brokers selling in the same market.

M. N. Smith, foreign division vice president for Ekco Products, reports his company had difficulty selling low-priced kitchen tools in South America. Low-priced competition had seized the market. Ekco tried to put some of its medium and high-priced items on display in that market. Local distributors said the stuff would never sell. Ekco finally harried them into putting the higher-priced products on display, and they've been top sellers ever since.

Keep new products coming along. It takes years to bring a new product out of the lab and into the domestic market. Creating a foreign market often takes an additional one to three years. It's worth it. When domestic sales drop, export sales often hold.

See that your broker concentrates his sales effort in dollar surplus areas. One small manufacturer now follows the dollars into such off-trail spots as Ethiopia, Guam, Ryukyu islands. He scored a 32 pct sales gain last year.

Check Patents—When you call on an export broker, tell him what you make, where you think it might sell, what it will cost him F. O. B. your loading dock. If it's good, he'll take care of the rest. Second, check a patent lawyer. Find out what it will cost you, if your item is patentable abroad. He'll be able to follow through on patent costs.

If you've found a good broker, your costs won't be any more than if you were selling to the U. S. They could be less. You can get names of several brokers from your local export trade club. Chicago has 450, New York lists 700-800.

PRINTS FACTS FAST: High speed printer from Minneapolis-Honeywell Regulator Co., prints 108,000 characters or 900 lines per minute. It's geared to work with medium-priced computer from M-H Datamatic Div.

Speedy Computers Sell at Lower Cost

■ Computer makers call their market shots with rifle precision. Datamatic Div., Minneapolis-Honeywell Regulator Co., is moving into the medium-price computer field. And the firm believes the price of its new Honeywell 400 computer will make it attractive to 6000 of the top 10,000 U. S. business firms.

Datamatic Div. president W. W. Fink calls the new unit, "The most powerful available in the moderate-price field." Coupled with the high speed printer above, the machine will perform 6000 operations per second, and print the results at a 900-line-a-minute pace.

Market Approved — Datamatic Div., is active in the higher-price computer field. The Honeywell 800 computer has generated a $35 million order backlog, though first deliveries aren't due until this fall.

Figuring that once a customer tries his first computer, he'll find more computer jobs in his plant than it can handle, Datamatic has designed the 400 medium-price unit to work in tandem with the more expensive 800 line.

Advance in the Field — Minneapolis-Honeywell moved into the computer field five years ago. First products were the very large units. Seven were built, are valued at a total $12 million. By contrast, the user will rent the new 400 on monthly rate of $8,860.

Is Defense Bid Reform Coming?

Congress May Act to Spread Competition

Laws may be tightened to make sure small firms have a better opportunity to compete for defense contracts.

Many orders now awarded without use of open bidding—By N. R. Regeimbal.

■ Congress, armed with new evidence from the military and recommendations from government auditors, may finally crack down on the shortage of competition in defense contracting.

Legislation is now being drafted restricting the right of the military to get around the general mandate from Congress that all possible government contracts be awarded by competitive bidding.

One Source Bid—Now as much as 80 pct of the negotiated total, and about half of total procurement orders by number, are negotiated with a single source. The remainder of the negotiated contracts involve proposals from two or more possible contractors, but still with no open bidding.

A Senate Small Business subcommittee charges that the military, through unclear laws, misuse of regulations, lack of initiative, and by permitting abuses by large contractors, is freezing out small firms.

Slow Going—Relief for small firms who complain they've been locked out of the defense business probably won't be complete, and it won't come right away. It would be at least another year before a procurement reform bill could pass Congress. And the extreme complexities of today's weapons and of present procurement laws and regulations will mean a slow reform process.

The glitter of hope that more firms will be able to get a share of the defense procurement dollar stems from recent hearings.

At present, military buying officers have 17 separate exceptions (each with sub-exceptions) to the general rule that all buying must be by competitive bidding. The dollar volume of contracts awarded through negotiation has jumped from $9.7 billion in 1954 to $21.3 billion in 1959. But procurement by competitive advertising has risen only from $1.8 billion to $3.3 billion.

Changes Suggested—At the hearings, the General Accounting Office blueprinted changes in procurement regulations which will probably become the basis for proposed legislation later this year or next.

In general they would put increased emphasis on formal advertising; tighten up requirements that must be met before negotiated contracts may be let, and try to get more competition when negotiated contracts are let.

Search Harder—Up for review is one exception which permits negotiated contracts "when it is impracticable to obtain competition," particularly where there is only one known source. About $4 billion of negotiated procurement (19 pct) came under this regulation last year. Changes would force the military to try to uncover additional sources.

Why Congress Objects

Shortage of Competition—Of $24.6 billion spent in 1959, $21.3 billion was through negotiated contracts (80 pct with only one source), only $3.3 billion by competitive advertising.

Shortage of Coordination—Government Accounting Office watchdogs find case after case where one service buys the same part as another, with one getting it at a lower price.

Failure to Seek Competition—Congressional investigators charge too many military buying officers seek ways to use exceptions to rules requiring competition, rather than seeking more competition, more sources, more bidding.

Inadequate Specifications—Too often original development contract becomes production contract for life of an item because drawings and specifications are inadequate for potential competitors, or developer retains proprietary rights to equipment.

PORTABLE STRAPPER: At the show, U. S. Steel Supply Div. introduced this new power-operated portable steel strapping machine. Weighing only 14 lbs, it uses 15 to 19½-gage round steel strapping.

WRAPPED IN BLISTERS: Blister packing machine, built by Packaging Industries, Ltd., cuts cellulose acetate in strips. Blisters are then formed from the strip, products inserted, and the blister sealed to a board.

Packaging Dresses Up to Sell

Packaging material makers are going all-out to make their products more attractive, colorful, and useful.

Competition for a bigger share of the market was evident in Packaging Show developments.—By P. J. Cathey.

■ Today's package must do more than wrap the product. It's got to sell—and sell hard.

Visitors to last week's National Packaging Conference and Exposition in Atlantic City couldn't help coming away with this impression. Not after they saw what the more than 300 exhibitors are doing to make packages more interesting, attractive, and functional.

Wide Variety — Competition among materials for the wrapping market was pointed up by the displays at the American Management Assn. show. Emphasis was on newer materials such as plastics. But the makers of metal, glass, paper, wood, and textile products were also represented.

The prime struggle in packaging is shaping up in the drive of plastics and foil makers to take over applications previously filled by glass and paper.

Right now, paper is still the No. 1 packaging material, followed by metal containers, glass bottles and jars, and then plastic products.

Aluminum Breakthrough? — An upsurge in the use of aluminum, in foil, foil-plastic combinations, and in cans was predicted by aluminum sales executives.

"Foil-polyethylene combinations and aluminum cans will spearhead a packaging breakthrough this year," said Paul Murphy, vice president, Reynolds Aluminum Sales Co. He expects the aluminum packaging market, estimated at $180 million last year, will grow to $380 million by 1965.

Greater use of aluminum cans this year, he predicts, would boost aluminum demand for that market to 50 million lbs, almost double the 1959 total.

Lab Work—In a move to expand packaging markets, aluminum companies are going all-out on product research. At the show, Aluminum Co. of America announced a new packaging development laboratory.

Reynolds pointed out its container development center at Bellwood, Va., will be completed early this summer. It's designed to push development of new types of aluminum cans and containers.

All-Foil Pouch—Another company, Kaiser Aluminum, expects a 65 pct increase in aluminum foil use in the next ten years. Work is underway on an all-foil pouch with welded closure. Instead of folds and adhesives, the pouches would be joined by pressure, causing a molecular flow to weld the seams of the bag.

Engineers Face Space Problems

SAE Meeting Shows Metalworking Is High on the List

Aerospace projects demand new materials that are getting harder and harder to handle.

Problems arise in making, forming, machining and fabricating the materials.—By H. R. Neal.

■ Metals and metalworking techniques are high on the list of daily problems that confront aerospace engineers.

And the farther the country advances into the space age, the more complex grow the engineering problems. Solution of one set of problems often gives rise to another—or several others.

Engineers, meeting in New York last week at the Annual Aeronautical Meeting of the Society of Automotive Engineers, gave an indication of progress and problems in aerospace metalworking.

Metalworking Headaches — But the new metals, alloys, and materials developed to meet aerospace demands are causing metalworking headaches. They're expensive to produce and hard to form, machine, or fabricate.

In addition, engineers are hampered by inadequate communication of developments, according to Michael Field, president of Metcut Research Assoc., Cincinnati. The company is engaged in metallurgical research and testing.

Mr. Field points out that new alloys are being developed "at the rate of one a week, or so it seems." And often, little is known about these new materials. Getting the answers takes time.

Approach With Respect—"You have to approach new alloys with a great deal of respect," he says. Recently, for example, the company received six bars of a new alloy and was asked to make a lot of test specimens from them. The bars, only 6 in. long, were worth $2000. Because of the value of the material, start on the job was held up until the company could learn something about the properties of the metal.

"It was like being told to cut a diamond," Mr. Field says. "We were afraid to touch it until we at least had some idea of what it was like."

Conventional metalworking techniques must be refined or entirely new ones developed to handle these new materials.

Forging in Transition—In forging, one of the biggest problems is the transition to high-density materials, according to E. A. Pearsall, developments supervisor at the Worcester, Mass., forge shop of Wyman-Gordon Co.

A material like Rene 41, he points out, must be forged at a comparatively low temperature of 1950°F. The allowable temperature drop is small — in the range of

NUCLEAR DEVELOPMENT: Tubes made of a zirconium alloy, Zircaloy-2 make possible a new concept in nuclear production reactors. Welding is done in a specially designed 40-ft long dry box (above). A joint project of Allegheny Ludlum Steel Corp., The Budd Co., and Tube Reducing Corp., the special tubes are typical of demands made on metalworkers.

125°-150°F. So there is only 30 seconds or less to move the piece from the furnace to the forge and back for reheating.

The combination of stiff material and short periods under the hammer result in little movement of the metal from each blow. Trimming and machining parts of materials like this is difficult, too.

Removing Metal — Recent developments in non-machining methods of metal removal solve some of the problems in the area, Metcut's Mr. Field points out in discussing aerospace metal removal techniques. But he says electrical discharge, electrolytic machining, ultrasonics and chemical milling are highly specialized techniques.

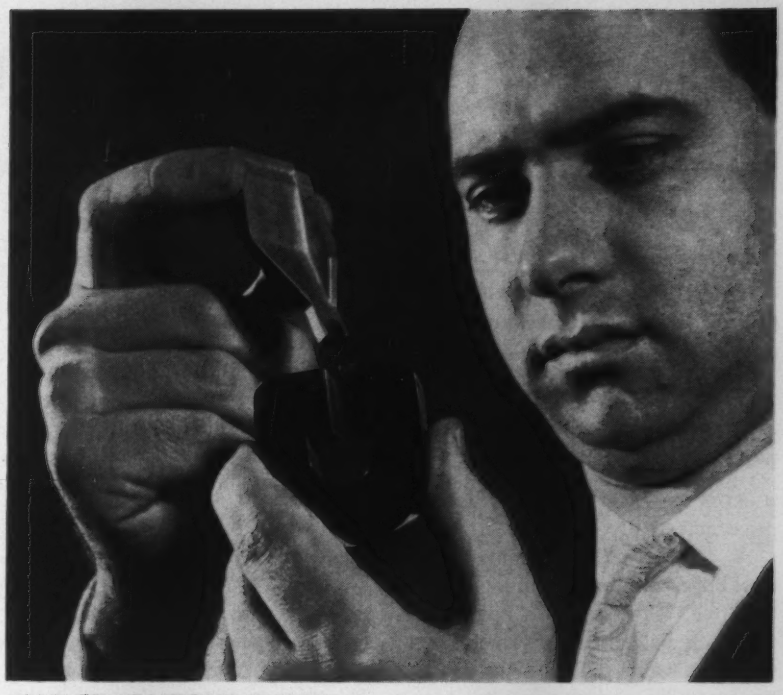
Generally, they offer much slower metal removal rates than conventional milling and cutting methods. And one method isn't always as effective as another when applied to some of the new alloys.

Which method works best with what materials? Mr. Field's advice is to ask the builders of each type of equipment. Both the methods and materials are so new that experience is still being gained by trial and error.

Explosive Forming—Progress is being made in the field of high energy rate deformation—explosive forming, hydro-electric, and pneumatic-mechanical. These methods have a number of advantages over conventional methods, says E. W. Feddersen, chief of manufacturing research and development for the Convair Div. of General Dynamics.

But, he cautions, these are not high production methods and a lot of development work still remains to be done. The several processes still require a great amount of manual work. Handling devices for tools and material must be improved.

A number of sessions were devoted to nuclear space engines and powerplants for spacecraft. The need here is for lighter, more efficient shielding materials, and materials capable of withstanding very high temperatures.



COMMUNICATIONS JEWEL: Small crystal of synthetic ruby is held above a 12 oz magnet by Dr. T. H. Maiman, Hughes Aircraft Co. scientist.

Army Gets a New Electronic Ear

■ The Army has a new "ear", said to be the most sensitive listening device, pound-for-pound, in the history of science. It is sensitive enough to pick up the faint radio signals from transmitters millions of miles in outer space.

A 25-lb "ruby maser" amplifier, the electronic listening device, was developed by Hughes Aircraft Co. for the U. S. Army Signal Research and Development Laboratories at Ft. Monmouth, N. J., where it is being used experimentally.

Listening Post — Possible uses include detecting radio "beeps" from space vehicles millions of miles away, making it possible to communicate with satellites or to track space-probe missiles at greater distances.

It could enable earlier detection of intercontinental ballistics missiles than is now possible.

Other possible uses: Picking up signals from distant stars (radio astronomy); facilitating communication between space vehicles.

The heart of the listening device is a synthetic ruby. In operation, it is cooled to a temperature of minus 452°F. At this temperature the jewel detects and amplifies very faint radio signals in the high frequency range of microwaves.

Bargain Price—The low temperature, maintained by liquid helium, slows the movement of atoms and electrons in the ruby. This cuts the "noisy" natural collisions of atomic particles to a minimum. The result is static-free signal booster.

How to Plan Warehouse Buying

New Price Schedules Can Cut Small-Lot Costs

Recent service center price changes brought with them complaints that they were not cuts, but increases.

Warehouse people now take the trouble to explain how they work.—By K. W. Bennett.

■ Are the new steel warehouse price cuts really cuts?

A stream of complaints from steel buyers hint at something amiss. Said one, "My steel costs have gone up seven pct since the warehouses said they were reducing the mark-up on small lot orders. What kind of savings are those? Two of my vendors are saying the same thing. We can't all three be wrong."

In February, the steel service center industry announced a new markup system for small lot orders of warehouse steel (See The IRON AGE, February 25). The announced purpose: to give to the buyer of small lots of steel the pricing concessions made to big order buyers a year ago. (The IRON AGE, May 28, 1959.)

Savings Are There—The savings are there, just as steel service centers say they are. But small lot buyers appear to be having some trouble in revamping their buying habits to profit by the price concessions.

The situation is worrying enough warehousemen that one major chain is sending out its entire sales force on a kind of consumer education program. Another reports its spending entirely too much time writing letters to irate customers who feel something is wrong, but can't quite spot the trouble.

Sample Savings—Savings can be made. And they can be made on small purchases. Here are a few cases in point. A 412-lb. plate order for 5/16 x 48 x 96 in. plate came in recently. This was a typical maintenance material order. Under old pricing, the order would have come to $57.40. The new price worked out to $48.29.

A 2788-lb/¾ x 4 in. hot-rolled flat order for a medium-sized sheet

Cut Small Lot Buying Costs

Increases or Decreases in New Warehouse Pricing

The new warehouse prices on small item quantities represent important concessions, if properly used by the buyer.

The table shows minus signs for order quantity, item quantity price reductions. Plus signs show increases.

As the chart indicates, there are only eight increases compared with 16 areas of decrease. Large order quantities are unchanged.

If an order falls into a "plus" area on the chart, indicating higher costs, check the possibility of combining items for larger order quantity, or stepping up item quantity. It may mean a fair savings.

Item Weight	30,000 & over	20,000 to 29,999	10,000 to 19,999	5000 to 9999	2000 to 4999	1000 to 1999	400 to 999	100 to 399	Under 100
10,000 lb and over	(NC)	(NC)							
5000 to 9999 lb	(NC)	(NC)	(NC)			Dollars per CWT			
2000 to 4999 lb	(NC)	(NC)	(NC)	+.20					
1000 to 1999 lb	(NC)	(NC)	(NC)	+.20	+.60				
400 to 999 lb	−.25	−.25	−.25	−.05	+.35	+1.25			
100 to 399 lb	−2.00	−2.00	−2.00	−1.80	−1.40	−.50	+2.25		
Under 100 lb	−3.00	−3.00	−3.00	−2.80	−2.40	−1.50	+1.25	+5.25	

metal shop would have cost $270.16 under 1959 pricing. Now it costs $263.47. A building contractor recently bought 11,168 lb of standard structural beam 18 x 54.7 lb per ft for $924.71 which would have cost him $999.54 in 1959.

Add Items—The above are invoices pulled from a service center order department on short notice. Using the chart on this page, you can push more of your high-priced orders into the "dollars saved" category. For instance, if ordering a 100-lb item, it's a good idea to remember that holding the order until you can add a second small item, and boost total order quantity over 399 lb, you reduce the amount of increase in the new price by $4 per cwt.

Your area of increased cost, as the chart indicates, is mainly in single items of less than 399 lb, and items of 399 lb or less combined into an order of less than 1000 lb. A difference of a few pounds can spell the difference between a $1.25 per cwt increase, or a $1.50 decrease. The difference, in dollars per ton, is $55.00.

No Markdowns—It's still possible to buy items in less-than-100-lb quantities. But you'd better combine them into an order of 1000 lb minimum. Buying 30 days' supply of an item when you've been buying in 15-day quantities would seem to violate the low inventory maxim. But a price difference of $2.75 per cwt can offset a considerable amount of inventory carrying costs.

The low item quantity markup doesn't sound like a markdown. It isn't. But if you are typical of the average warehouse pattern, then not much more than one pct of your buying should fall in the maximum increase area. And the majority of your purchases should drop slightly in price. The steel service centers never claimed more than an average $1 per ton reduction in costs of steel buying to the average customer. But if you watch your small order quantity purchases, it's entirely possible to beat the average, and by substantial margins.

Treasury Opposes LIFO Relief

Passage of Mason Bill would cost government "several million dollars," says Undersecretary of Treasury, Fred C. Scribner.

Bill aims to give relief to firms suffering extra tax load as result of steel strike.

■ Treasury Dept. officials are against special help for firms suffering extra tax loads under LIFO tax accounting as a result of last year's steel strike.

The arguments: Passage of pending legislation would cost the government "several million dollars" in revenue. It might lead to more requests for additional loosening. It would create additional problems, and would be difficult for the government to administer.

Tells Committee — Undersecretary of the Treasury Fred C. Scribner, in commenting to the House Ways and Means Committee on a measure (H. R. 6014) sponsored by Rep. Noah Mason, R., Ill., says:

"While recognizing merit in the arguments of proponents, it should be noted that the privilege to elect LIFO ordinarily entails risks, such as economic downturn and material shortages due to a variety of situations. Enactment of the bill would eliminate one of the risks, regarded by many as inherent in the LIFO method, which taxpayers assume when they adopt this method."

What Is LIFO? — LIFO is a method of accounting by which inventory most recently purchased is assumed to be the first sold (last in, first out). It generally means a reduction in taxes in periods of rising prices, but may mean higher taxes in time of falling prices. Thus an important drop in inventory at the end of an accounting year will produce large "paper profits" for a firm using the LIFO method.

The Mason bill would permit a firm which liquidated inventories involuntarily as a result of a labor dispute to replace the inventories within two years and deduct the difference between the liquidation and replacement values from taxable income.

Proponents say it is necessary because it would prevent discrimination between a firm whose accounting year fell before a strike, and one whose year fell at the end of a strike when shortages prevent replacement. Similar temporary relief was granted during World War II and during Korea.

Objections—Here are the principal objections of the Administration to the measure:

Materials rationing and excess profits taxes, which no longer exist, made such legislation "more compelling" during wartime.

The limited measure "might become a precedent for further liberalization of accounting procedures in the LIFO area."

Relief would not be limited to cases of actual labor dispute, but where a strike was "threatened or imminent." It would apply to a firm whose customers buy heavily anticipating a possible strike.

Other Points—It would present difficult administrative problems, as in local strikes where goods would be available from other suppliers but harder to get or more costly. It could retroactively affect taxes on dividends to stockholders. How hard would a firm be required to try to replace inventories would also be a problem.

Atomic Scientist Takes a Dive

AFTER BIG GAME: Nuclear scientists at Allis-Chalmers Co.'s Greendale, Wis., labs don swim suits and masks and dive into 40 ft of special high purity water in experiments to perfect the "Pathfinder," first nuclear power plant that will include a reactor with an integral nuclear superheater. A scale model of the plant was displayed at the Atomic Exposition in New York last week.

$5.5 Billion Spending In Steel Race

An estimated $4.5 billion to $5 billion will be spent for expansion and modernization of facilities by all nations of the world in order to keep the pace or gain a place in the world iron and steel production race.

These figures are estimated by the American Iron and Steel Institute after a study of published reports and are believed to be on the conservative side.

U. S. First—U. S. steelmakers are expected to spend about one third of the world total, or $1.6 billion.

Russia, second to the U. S. in steel production, is expected to spend about $1 billion. If anything, the Institute says, this figure is low.

The European Iron and Steel Community, the United Kingdom and Japan will spend a combined total of about $1.1 billion. And nearly half of this total will be spent by Japan.

Smaller Countries — Large expenditures will be made by the Communist satellite countries, South America, India, Canada, Mexico and elsewhere. This total will exceed $750,000.

Sizeable outlays are scheduled to be made, or planned, in Portugal, Spain, Turkey, Pakistan, Iran, North Vietnam and many other countries.

More Increases—The Economic Commission for Europe reports that Africa's steelmaking capacity will increase more than 80 pct during the next five years. Middle East capacity will rise about 260 pct and potential in the Far East will increase about 140 pct. Other increases include: Oceania, 56 pct, Latin America, 139 pct; Russia, 50 pct; Europe, 26 pct and North America, 23 pct.

ICC Allows Lower Ore Freight Rates

The Interstate Commerce Commission will allow drastically reduced rail freight rates on some low-grade Michigan iron ores to permit them to compete with imported ores.

The reductions were proposed by two railroads as a result of competition from low-cost imported ores now entering the lower Great Lakes through the St. Lawrence Seaway.

The lower rates are: A reduction of $1.45 a gross ton to 55¢ for ores from the Gogebic range to Escanaba, Mich. (transported by the Chicago and Northwestern Railroad), and by $1.25 to 87 cents a ton for ores from the same range to Ashland, Wis., hauled by the Soo Line Railroad.

House Approves Influence Ban

The House of Representatives has voted to ban influence peddling by newly retired officers. Any officer who takes a selling job with a defense contractor within two years after he sheds his uniform would be courtmartialed under the bill passed by the House and sent to the Senate for approval.

Only a technicality stopped a House vote on an even stiffer bill aimed at stopping military influence peddling. The bill calls for criminal penalties and includes the employers of retired military men turned lobbyists.

More Taconite Coming

Capacity of taconite facilities of the Reserve Mining Co., Silver Bay, Wisc., will be increased by 60 pct. The company is owned jointly by Republic Steel Corp. and Armco Steel Corp.

The company's present capacity is about 5.5 million tons of taconite pellets a year. The increase will raise this to about 9 million tons. The increase, however, is contingent on approval of the recent settlement between Reserve and Mesabi Iron Co.

Wayne Ewing

He Had to Choose a Career

Wayne Ewing, president of ASTME, had to choose between two widely separated careers.

He chose tool and diemaking and today manages two important California plants.

■ Had Wayne Ewing, president of the American Society of Tool and Manufacturing Engineers, followed his first love, he probably would not hold his present post.

Instead, he might be leading a large dance band, and playing to crowds in some of the nation's better nightspots and hotels. When he began plotting his future 25 years ago he was forced to choose between a musical career or one along the path of tool and diemaking.

Night Work—His career in the die industry actually began while Mr. Ewing worked as a janitor for the Talon Zipper Co., Meadville, Pa. His thirst for engineering knowledge led him to night school courses in this field. And he convinced Talon executives to let him start as a tooling apprentice. This meant a salary cut of $6, from $20 a week to $14.

And at the same time he continued his musical activities, picking up extra money playing at dances and parties. But eventually music lost out. Mr. Ewing moved to Detroit as a graduate apprentice. And, a short time later, he found himself in the tool business with two partners.

War Tools—World War II solidified his position in the industry. War time requirements put a high price on his talents and soon he was making parts for aircraft, tanks, and other military equipment. He also did work on the Manhattan Project for the atomic bomb.

Later, with one of his partners, Mr. Ewing sold his interest in the Detroit plant and bought the California Arrowsmith Co., Los Angeles. Today, with the same partner, Harold Murdock, Mr. Ewing manages Arrowsmith Tool and Die Corp., and Arrowsmith Plastic Tooling, Inc.

WAYNE EWING: The end of a challenge.

Long Record — When Mr. Ewing's presidency of ASTME expires this month, it will round out 14 years of service to the society. He first joined the Los Angeles Chapter in 1946. He worked his way through all the elected offices and in 1951 was named vice chairman of the national membership committee.

A strong supporter of the Society, Mr. Ewing's formula for progress of tooling and manufacturing engineering is: Support of ASTME for exchange of vital material. And, an intensive program of reading technical publications.

For business success Mr. Ewing says, "It has long been my conviction that there is no substitute for hard work, diligence, and enthusiasm."

The Huntsman—Away from his work, Mr. Ewing leaves civilization behind and heads for the wilds of Wyoming. There, with his wife, he spends as much time as possible hunting elk and bear.

But his biggest challenge along the hunting line is the bear, he says. "A bear will pit his wits against yours and will be as cunning and deceptive as possible. To me there is no more challenging kind of hunting."

And Mr. Ewing got his bear.

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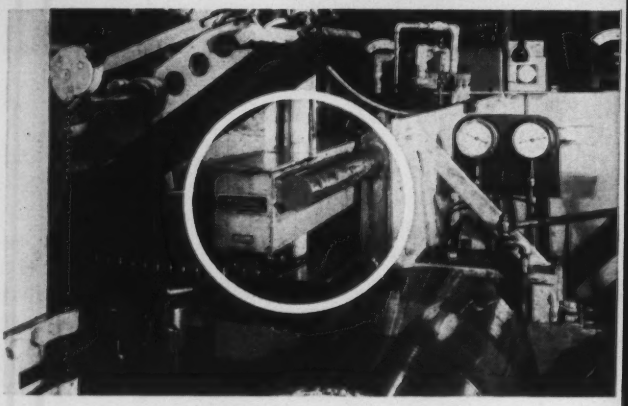

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Let Foreman Share Management

With his duties and responsibilities, the foreman is management to the men on the production line.

But unless the front office backs him up properly, it can lose his support.

▪ How much support do you give your foremen?

The backing and recognition you give or withhold can be important. If left largely to himself, the foreman can drift into a corporate no-man's land. He won't be management-conscious unless management is foreman conscious.

Costly Waste—Alfred J. Bohl, a business management consultant with Wolf Management Eng. Co., Chicago, points out where management may be missing the boat.

"Failure to give supervisory personnel proper authority and training is costing top management a good deal of money it can't afford to waste," he says.

Mr. Bohl emphasizes that a foreman directing 12 to 15 workers controls the spending of several hundred thousands dollars in labor, material and overhead every year. His area of influence is wide. Problems connected with personnel, labor costs, quality control, safety, housekeeping, tooling, scheduling, and grievances come into focus at his level. In addition, he affects sales, industrial relations, and customer good will.

Advice Not Wanted—But is the foreman accepted as part of management? Based on his duties and responsibilities he must be, says Mr. Bohl. "Management at no other level bears a wider range of managerial responsibility."

However, he adds, many firms regard their supervisory personnel as incapable of dealing with the everyday operating problems of managing their departments. So the problems leave the floor and are passed on to top management.

When this happens, the foreman "either tries against odds to continue representing management or gives up the power he previously felt he possessed."

"What these managements fail to recognize," says Mr. Bohl, "is that to the worker, the foreman is management. The way the foreman understands or misunderstands company policies and rules is the way the employee will understand them. He is the 'Boss,' the company, the whole works."

What's Needed? — What, then, can the front office do to make foremen management-conscious?

These are Mr. Bohl's suggestions: Recognize the varied responsibilities he has. Realize his compelling need for management support in carrying them out. And reward him by making it possible for him to fulfill his desires.

How Much Maverickism?

▪ One of the hottest debates in business circles is whether management prefers the conformist or the individualist. The trend to non-conformity seems to be gaining more supporters.

But the maverick won't be comfortable in the executive suite until the prophets of individualism practice what they preach. This is the view of George S. Odiorne, director of the University of Michigan's Bureau of Industrial Relations.

What's Acceptable — "The real problem is this:" he says, "What is the acceptable mode of behavior for the new maverick. You may rest assured that it will not extend to punching the Old Man in the nose or stealing his cigars. Rather, it will nestle itself close to the image of the maverick behavior that can be induced from what he says and what he approves.

"Most of the lasting effects of the New Maverickism will be through an infusion of individualism into business from the recruits. . . . The major immediate effect, however, among the experienced bulk of managers and staff will be a new conformity—to a behavior which looks like maverickism."

Slight Spring Rise In Jobs Expected

Employers in 90 pct of the nation's main production centers expect a moderate spring pickup in job totals, the Labor Dept. reports.

Hiring plans in 149 major areas show that industries expanding seasonally will lead the rise. Some of these are construction, trade, service, and food processing.

Mixed trends are looked for in the durable good industries until mid-May, with little change in automotive or steel labor forces.

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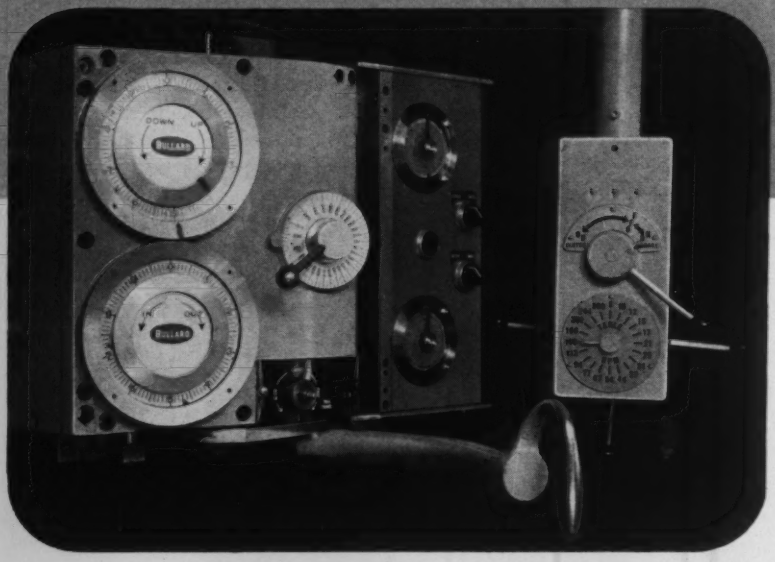

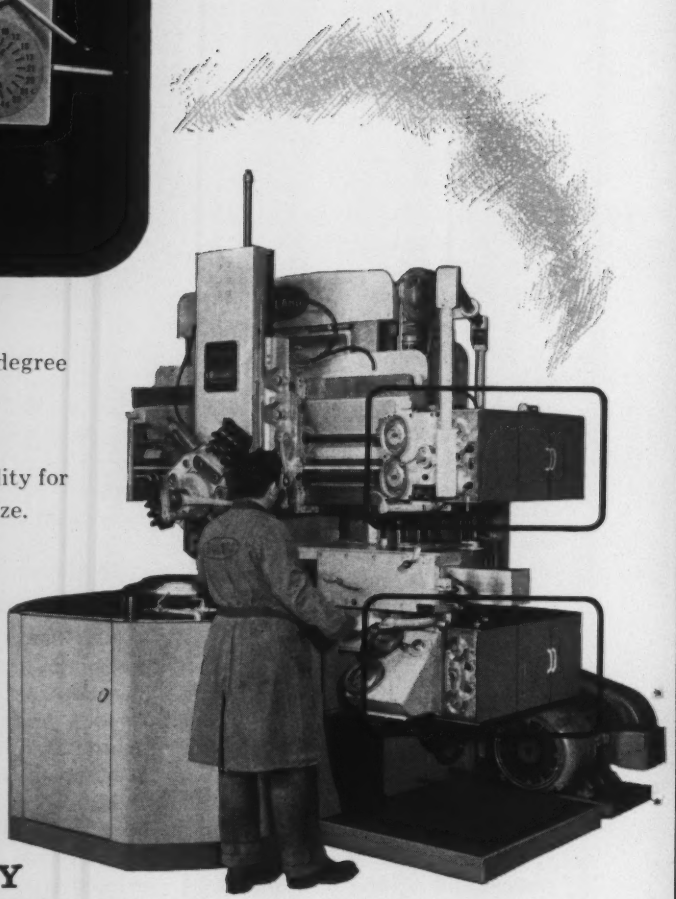

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Automakers Watch Fleet Market

Lease, Rental Autos Reach 44 Pct of Fleet Buying

Strong gains in truck and auto leasing are boosting fleet purchases.

These sales showed a gain of 90,000 units last year.—By A. E. Fleming.

■ The automotive industry is increasingly conscious of its fleet market.

A major reason is the continued development of the motor vehicle rental and leasing business. There's also evidence that compact cars will be very important factors in the fleet trade.

Speaking in Detroit, B. J. Nichols, Chrysler Corp. group vice president of automotive sales, told the National Assn. of Fleet Administrators, "You're making yourself felt as a growing force in the auto industry. We know it's to our interest as well as yours for us to recognize fleet problems and do all we can to help solve them."

Business Has 18 Pct — Private business today owns 11 million of the 58.6 million cars in use in the U. S., or nearly 20 pct of the total. Private business also owns more than 10.5 million of the 11.8 million trucks in use, or about 90 pct of the total.

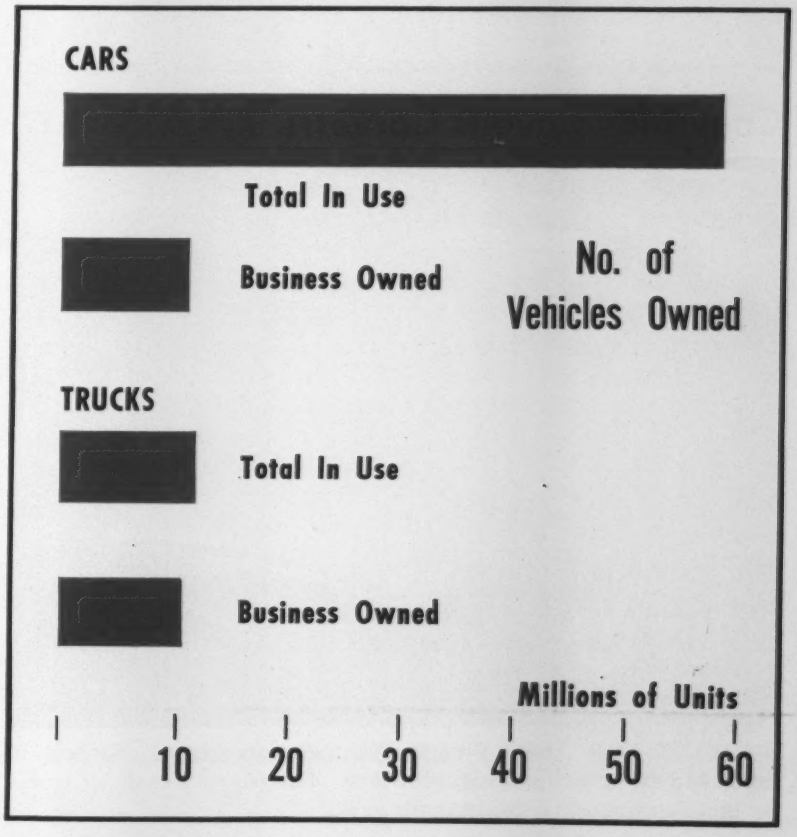
It isn't known exactly how many of these private business vehicles are part of fleets. Farmers, for example, own 3 million trucks. And one-vehicle companies account for a big share of business ownership.

Fleet Market Grows—But as an indicator of the growth of the fleet market, Mr. Nichols points to companies which buy vehicles in lots of 10 or more. He says that in 1958 these "10-or-more" new vehicle registrations totaled 430,000 units. In the first half of 1959 they reached 260,000. Doubling the January-June figure provides a rough estimate of 520,000 for entire 1959, or 90,000 more than 1958.

Mr. Nichols says leasing and renting account for much of the fleet growth. Latest figures on the "10-or-more" basis show the rental-leasing business is accounting for 44 pct of new car fleet registrations compared to 38 pct in 1957, and for 14 pct of new truck fleet registrations against 9.5 pct in 1957.

Savings in Compacts — What about the compact car's effect on fleet sales? Will it spur interest? R. D. Chapin, Jr., executive vice president of American Motors' automotive division, thinks it will. He points out compacts should yield at least 21 miles per gallon of gasoline, for a saving of $76.80 annually for 16,000 miles of driving. He

More Cars for Business Use



calculates this can represent a saving of at least $100 million for purchasers of the 1.4 million compacts he thinks may be sold for fleets in 1961.

Mr. E. J. Parker, fleet administrator of Hartford Fire Insurance Co. Group, Hartford, Conn., says his group isn't using compacts, although over half of the 200 NAFA members have bought them, some as many as 800 units. But Mr. Parker concedes he has his eye on compacts, particularly the medium-compacts coming into the market.

Mr. Parker says his Hartford group is sticking for the time being to the middle-priced series of Chevrolet, Ford, Plymouth and Rambler. All models are equipped with automatic transmission and V-8 engine for "safety reasons." They're supposedly safer because the automatic transmission lets a driver keep his hands on the steering wheel at all times, while the V-8 has an extra power reserve.

Higher Fleet Trade-ins — Also, Hartford trades in its fleet vehicles every two years. Mr. Parker figures automatic transmissions and V-8s help bring a better trade-in price, offsetting a compact car's savings in gasoline and maintenance over a two-year period.

Further indication that compacts are not yet hogging the fleet market comes from H. E. Chesebrough, general manager of Plymouth-De-Soto-Valiant Div. He predicts more Plymouths will be bought for fleet use in 1960 than any other year in Plymouth history.

Mr. Chesebrough says Plymouth fleet sales in the first four months of the 1960 model year equaled total sales in both the 1958 and 1959 model years. They've already reached 62 pct of 1957 model fleet sales, Plymouth's best year in this market.

New Corvette

The second experimental car in a month rolled from Detroit's design chambers this week.

The latest dream model is a version of the Chevrolet Corvette, named the XP-700 Corvette. Early in March, the Plymouth XNR, a 2-passenger sports car, bowed.

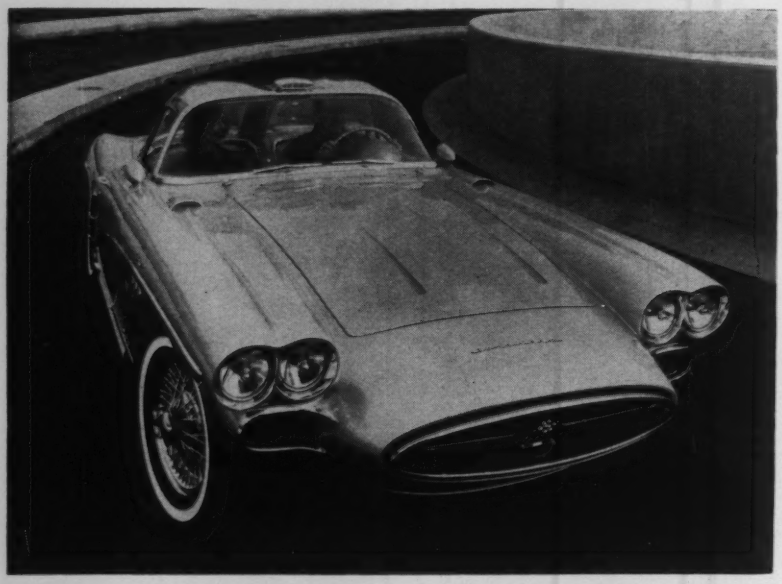
The "idea" Corvette was designed by W. L. Mitchell, vice president in charge of General Motors Styling. The chassis is conventional Corvette production. But there are plenty of styling innovations. Among them: a low hood overhang of the fiber glass body; broad frontal air scoops; transparent passenger canopy; and snubbed rear quarters, popular with the avantegarde sports car set.

Influence the Future—Chevrolet says the innovations most likely to influence future auto design are: Glare-eliminating "bubble top"; circulation venting system; and a periscope-type rear view mirror which gives a completely unobstructed view of the road behind.

Front fender air scoops for added brake cooling and "floating" grille guard are other design highspots.

There's talk that the XP-700, or something close to it, will be the Corvette that goes into the Chevrolet showrooms as a 1962 model. A radically different Corvette has been a topic of conversation around Detroit the last couple of seasons. Word is the 1961 creation will be a restyled version of this year's model.

Chevrolet Unveils Corvette XP-700



STRICTLY FOR TEST: Newest Chevrolet experimental car will be introduced at the International Auto Show. Innovations include air scoops for brake-cooling and a floating grille guard.

Computers A Must

The day of the intuitive automotive engineer is over. From now on: "Learn to use the power of electronic computers, or else."

The "or else" means facing the possibility of losing out to competitors who use these new tools, warns Prof. R. E. Weil of the Chrysler Institute of Engineering.

"In the past," says Prof. Weil, "many engineers have relied on intuition or time-consuming experimental methods in the design and development of automobile components. The automotive engineer today is faced with a rapidly advancing technology. To take advantage of changes in technology, the engineer must be able to evaluate a design completely in a relatively short time. If he's unable to do this, his company or his product may lose to competition."

Typical steam forging hammer

REQUIRED SAFETY FACTORS in steering arm assured by designing it to be forged

By designing with forgings, a truck manufacturer can count on the required safety factors, with minimum "beefing-up" of parts to offset unknown internal structures or non-homogenious materials.

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Swimming Pool Sales Will Grow

Market Heads for Billion Dollar Level

Farwest leads the nation in pool construction, but sales are increasing elsewhere.

Metal products are needed both for pools and auxiliary equipment.—By R. R. Kay.

■ There's a new $1 billion industry in the making—swimming pools. To metalworkers this means a fast-growing demand for a wide range of their products.

More Pools in West—The big boom in swimming pools started in the Farwest. California alone has 100,000 of the 250,000 pools in the whole country. But sales are picking up in the East—may soon outpace the Farwest.

Last year, new pool construction went over the $800 million mark. Industry leaders predict a 25 pct gain this year. That would put sales over $1 billion.

What Builders Use — Here's a rundown of some of the products the swimming pool industry uses: Reinforcing bars, pipe, plumbing fixtures, pumps, heaters, filters, construction and maintenance equipment. And there are firms making all-steel pools.

Outdoor living by the pool widens the market even more. Metal furniture, aluminum cabanas, torch lights, sound equipment, locker and checkroom supplies are a few of the items that find a good market.

Coming Events—Trends developing in the Farwest will affect the national picture. Everett Landon, San Mateo, Calif., whose firm makes and finances pools, points to:

A strong trend to community pool clubs. This is a project where neighbors in a suburban area get together and build a big pool for community use. Top cost is around $60,000. Some communities, Mr. Landon says, have paid off the cost in under two years.

Growing interest in factory and apartment house pools. In California, the pool is nearly a must for new apartment projects. Behind the factory pool idea is its value as a recruiting aid, employee morale booster, and customer drawing card.

More pool financing. Money lenders find pools a good risk and good investment. Pools don't lose their value. In fact, they're an asset to a property when it's up for sale.

Markets Abroad—Growing foreign markets. Pool builders in the Farwest are aggressive in promoting new business in South America, Canada, and Mexico. Mr. Landon's firm reports business 150 pct ahead of last year in Colombia and Peru. Australia and the Bahamas show promise.

Aluminum Eases Handling of Duct Work

VENTILATING SYSTEM: Only two men are needed to lift large section of aluminum ventilating duct going into 28-story Kaiser Center at Oakland, Calif. Building's control system will use 300,000 lbs of aluminum duct sheet supplied by Kaiser Aluminum & Chemical Sales, Inc.

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Accuracies approaching zero tolerance are required for many mating parts. Examples include missile control components, fuel injection plungers, high pressure hydraulic valves.

The new CINCINNATI 4" Super Precision Grinder has been specially designed, built and equipped for this type of work. In combination with the remarkable Grind-A-Mate gaging system, this equipment grinds the OD of a shaft-like part to a preselected clearance with the prefinished ID of its mating part—within tolerances of .000010" for roundness, .000020" for straightness, ± .000020" for size, and a surface finish of 2 to 4 micro-inches. Grinding to these tolerances, at a semi-automatic production rate, completely eliminates the need for subsequent lapping operations. And, since the part is ground to match a hole, slight variations in hole size will not slow down production.

The Grind-A-Mate gaging system controls the entire automatic grinding cycle. Air jet gages continuously measure both the OD of workpiece as it is precisely ground, and ID of the mating part; and a high amplification differential meter measures the variation between these two diameters. Mating parts are automatically ground to any preselected clearance, regardless of individual ID variations.

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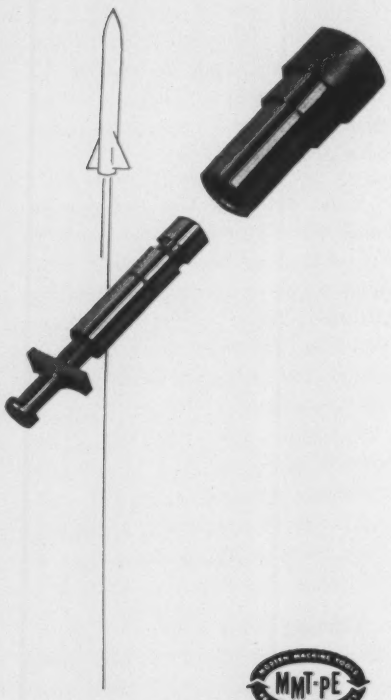

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Space Costs Expected to Rise

Billion-Dollar-a-Year Rate to Accelerate

A rocket to the moon is expected next year. Success in reaching other planets hinges on booster development.

U. S. expects to catch or pass U. S. S. R. in rocket thrust power by 1964.—By G. H. Baker.

▪ Learning about space is to cost at least $15 billion over the next 10 years. This figure could be a good deal higher, depending on rate of success, and whether or not the costs of metals, electronic equipment, and labor advance sharply in the years immediately ahead.

Rate to Soar—The rate of spending for exploration beyond our own planet is to accelerate each year. Thus, while spending is just under $1 billion a year at present, this rate is to move up to somewhere over the $1 billion mark in fiscal 1962 and will continue to climb in each succeeding year.

Here are the important space projects now in the making:

A rocket to the moon probably next year; to other planets in 1962. It depends on progress in developing boosters for our rockets.

Up to Russia—By 1964, the U. S. should be equal and possibly ahead of the U.S.S.R. in ability to thrust heavy objects into space. Saturn, now under development, is designed to supply 1.5 million lb thrust to a 30,000 lb load going into a 300-mile-high orbit. (There's no evidence the U.S.S.R. has anything of this power).

By 1965, NASA expects to be testing Nova, a rocket with up to six times the thrust of Saturn.

Manned flight into space is to begin within a year or two. But much testing of human capabilities must be accomplished before trips to other planets can be attempted.

Depressed-Area Aid Conflict Mounts

Republicans in Congress are at odds with the White House over the amount of government money to be pumped into depressed areas. Pointing to the slower-than-expected rate of business activity this year, many congressmen believe at least $250 million should be spent in an election-year bonus for high-unemployment areas. But the White House insists $57 million is enough to do the job.

The Senate has already approved a $250 million bill for this purpose, and the House is eager to go along with the amount. But President Eisenhower sends word he'll veto a sum of this size.

Strike Effects Peril Budget

Effects of last year's steel strike on corporate income—deeper than estimated earlier by government revenue experts—may shove the federal budget into the red in the current fiscal year.

Treasury Department experts estimated in January that corporate profits in the calendar year 1959 would hit $48 billion, producing revenue of about $22.2 billion. With other income, a $200 million surplus was forecast.

Now, they estimate corporate taxes will drop $500 million below this estimate. This leaves some $300 million to make up.

More Weapons or Shelters?

▪ Civil defense is either a $20,000,000,000 "must" or a gigantic fake, depending on point of view.

The Eisenhower Administration is asking the Congress to spend this hefty sum on digging holes in the ground for the U. S. population to hide in if an enemy should rain deadly radiation on our cities and towns.

Maginot Line—This is Maginot Line thinking, snorts Gen. Curtis E. LeMay, Air Force Vice Chief of Staff.

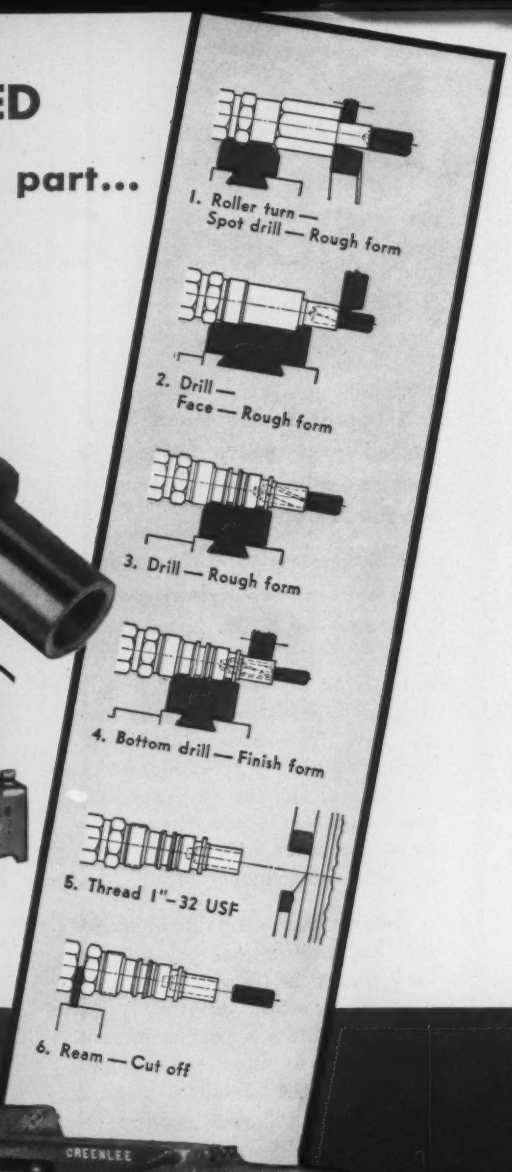
Gen. LeMay reminds the White House of the root question: "Should we build holes in the ground or more weapons?"

Positive Thinking—Positive national defense is to be bought by buying weapons, not by hiding, he points out.

The ruckus over civil defense is a hot issue in Washington these weeks. The White House believes in fewer weapons and more bomb shelters. Military men disagree. They argue that the shelter program is only a display of defeatist thinking, and that the only true way to win wars is to have on hand an adequate stock of weapons and the national will power to use them.

GREENLEE AUTOMATICS SPEED PRODUCTION of precision pump part...

The part is the injector cylinder of the Greenlee No. 798 High-Pressure Portable Power Pump manufactured by Greenlee Tool Co., a division of Greenlee Bros. & Co. Since the pump is capable of developing pressures up to 10,000 psi, extreme precision is required in producing the cylinder. It is machined from 1-inch hexagon 4150 chromium-molybdenum steel at a gross production rate of 48 pieces per hour. Sequence of the 13 operations performed is shown at right. Your Greenlee representative will be glad to help solve your precision part problems . . . just send us a print.


1. Roller turn — Spot drill — Rough form
2. Drill — Face — Rough form
3. Drill — Rough form
4. Bottom drill — Finish form
5. Thread 1"–32 USF
6. Ream — Cut off

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Engine Line Rebuilt for Aluminum

Change Equipment Designed for Cast Iron Work

Automakers are having automation equipment rebuilt to machine aluminum engine parts.

It isn't a small job, but it offers advantages that make it worthwhile.—By R. H. Eshelman.

■ With aluminum engines bursting into the compact car picture this year, production people face some big challenges. Despite past experience with aluminum, plants can expect problems with automation, experts say.

According to reports, Chevrolet has its share of problems with the Corvair engine. The company continues to keep both the Messina, N. Y., aluminum casting plant and Tonawanda, N. Y., machining line under wraps.

A recently completed V-8 engine head line points up some of the differences encountered in processing aluminum with automated machining.

Aluminum from Iron—The line was originally designed to handle cast iron. It was rebuilt for aluminum by a Detroit-area automation specialist.

Difference in engine design appeal slight, but they're enough to require completely new tooling. Machine bases, transfer equipment and hydraulics have been salvaged. However, all machine heads are new. So are coolant and lubrication systems, and wiring.

Fixturing and part handling on such a line definitely pose problems, according to engineers at Michigan Special Machine Co., which handles many such rebuilding jobs. More care must be used than with cast iron. Piece-parts must be held and transferred without scoring or damaging machined surfaces.

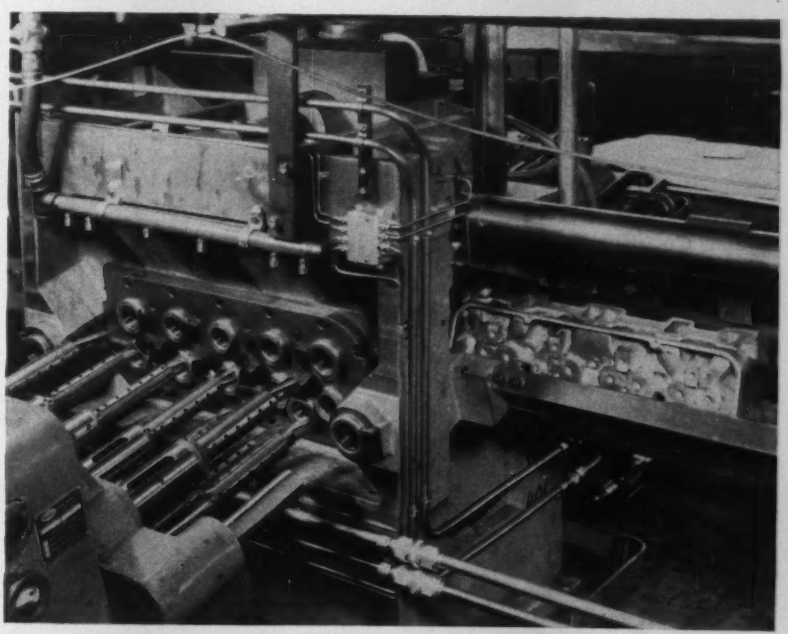
Sticky Chips—Then there's the sticky chip problem. Aluminum chips are light. When wet, they cling to even vertical surfaces. And higher speeds and feeds mean larger volume. The common way to beat this is with a flood of coolant, necessitating a special system. Since aluminum chips float, baffles and filtering demand extra attention.

Again, because of higher spindle speeds, lubrication may pose another barrier. It can be licked with a mist system, but installation in old plants will bring on other troubles. Without forced ventilation the entire work area may end up under clouds of vaporized coolant.

Look at Advantages—However, there are compensating advantages. Identical transfer lines should be able to cut floor-to-floor time, turn out more parts. Lighter weight also means greater speed and ease in handling. Carbide cutters may avert tool troubles expected with the more abrasive alloys.

Much of the equipment for these early aluminum engines will be rebuilds. Auto companies claim this confirms the soundness of building block. However, toolmakers note that little of the equipment now being rebuilt was originally designed this way. And some question actual dollar savings.

But a large part of the changeover cost can be charged off as perishable tooling. New transfer lines would have to be amortized as capital equipment.



BOLT HOLES: Here this 25-station transfer machine, rebuilt by Michigan Special Machine Co. spotfaces 11 bolt holes on an aluminum head for a new compact car to be introduced later this year.

INDUSTRIAL BRIEFS

Ready for Show—A non-oxidizing, high-temperature molybdenum wire will be shown by Chromalloy Corp., at the Design Engineering Show New York, May 23-26. A chromium alloy diffusion coating permits heating the wire to 2400°F for extended periods of time. A machining grade cemented carbide in a stainless sintered matrix will also be shown.

Sintering at Woodward—A $2 million capital expenditure program by Woodward Iron Co., Birmingham, Ala., will give the firm full ore sintering facilities. Also included in the program is a turboblower for the firm's blast furnaces, which will replace older blowing equipment. The firm recently merged with Alabama Pipe Co. to combat inroads of low priced foreign pig iron and scrap.

Southland Launching—The first atom-powered submarine built in the South has been launched at Ingalls Shipbuilding Corp., Pascagoula, Miss. The submarine, the Sculpin, is one of four new models which Ingalls will construct for the U. S. Navy. All are of the high-speed Skipjack class. The Sculpin displaces 2830 tons.

International Marketing—Strengthened participation in world aluminum oxide markets by Carborundum Co., Niagara Falls, N. Y., is expected to follow a manufacturing agreement with Pechiney of Paris, France. Carborundum will acquire a share of the capital of Les Abrasifs du Sud-Ouest, Pechiney subsidiary, which makes crude oxide and abrasives.

More Flame Plating—Expanding demand for flame-coated materials is reported by Linde Co., division of Union Carbide Corp. Linde Co., with flame plating facilities at Indianapolis, Ind., and Los Angeles, Calif., will build a third plant at North Haven, Conn. The plant will serve the New England and Central Atlantic states. Plant is scheduled for December, 1960, completion.

Budd Widens Range—Budd Co. has increased its participation in the instrument field with the acquisition of Metrol, Inc., Pasadena, Calif. Metrol produces electromagnetic testing devices for non-destructive test uses. The instruments acquired include alloy identifying, thickness gaging, and electromagnetic inspection devices.

More Swedish Steel — Swedish steel output climbed 18 pct in 1959, breaking previous records by 14 pct. Output of rail is a major factor in the advance. Part of the gains have come with stepped-up exports by Sweden to India, Brazil, and the Sudan. Steel exports from Sweden hit 474,000 tons last year.

Big Sandy in by 1961—A $4-million plant for activated carbon production has been announced by Pittsburgh Chemical Co. The new "Big Sandy" plant will be located in Boyd County, Ky. Construction will be completed in early 1961. Pittsburgh Chemical Co. is a wholly owned subsidiary of Pittsburgh Coke & Chemical Co., a major U. S. supplier of activated carbon for commercial applications.

Engineers Choose Stainless—The new United Engineering Center, New York City, will be sheathed in stainless steel and glass. The 20-story building will house 18 American engineering societies. The Center, valued at $12 million, will provide 180,000 sq ft of floor space. Gages of stainless sheet to be used range from 20 to 14 gage. Window frames, mullions and column covers will be made of type 302 stainless.

"Well, we do have one opening here for a man who's good at paperwork."

Expands Foreign Holdings—A. O. Smith International, S.A., will open a European subsidiary. The firm, which handles foreign business for A. O. Smith Corp., Milwaukee, has also concluded licensing agreements in Europe and South America. Ruhrstahl A. G., Hattingen, West Germany, will produce oil and petro-chemical equipment under A. O. Smith license. Casya, Buenos Aires, Argentina, will make and sell dispensing pumps in that area under a similar licensing agreement.

Foil Output to Double—Aluminum Co. of Canada Ltd., plans to spend $1.6 million in its Kingston, Ont., plant for additional foil producing facilities. The new equipment will double the plant's foil making capacity.

Back in Production—The New Britain, Conn., plant of New Britain Machine Company, is back in action. A nine week strike closed the plant. Company officials report the long shutdown did not affect company orderbooks and that a substantial backlog of orders is on the books.

Navy Needs Lifts—U. S. Navy Bureau of Aeronautics has contracted for 72 fork-lift trucks valued at $358,000. The contract, awarded to Clark Equipment Co., Buchanan, Mich., covers trucks of 4000 to 6000 lb capacity, spark-enclosed for use in semi-hazardous areas.

Kerr Heads NSMPA — National Screw Machine Products Assn. has elected C. L. Kerr president. Mr. Kerr is president of Kerr-Lakeside Industries, Inc., Cleveland.

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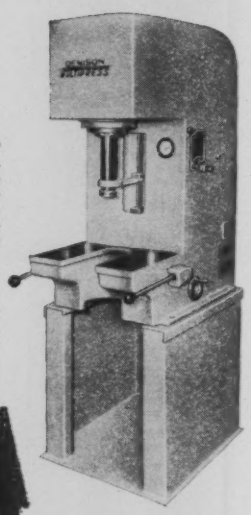

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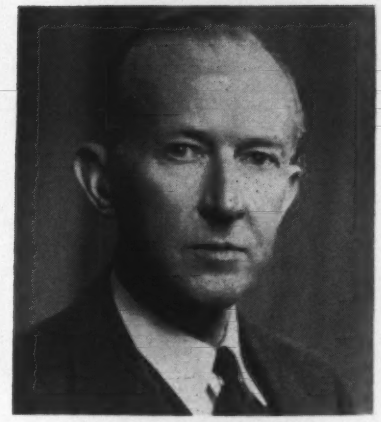


J. L. Young, appointed vice president, engineering technology, U. S. Steel Corp.

Sparton Corp.—**B. H. Thompson,** elected treasurer.

Aircraft Porous Media, Inc. — **J. A. Farris,** named manager, engineering liaison.

Brad Foote Gear Works, Inc.— **E. B. Smiley,** named sales manager. **R. J. Byerwalter,** appointed executive engineer.

Martin Co.—**J. L. Bloom,** named project engineer, Systems for Nuclear Auxiliary Power, Nuclear Div.

Shelby Metal Products Co.—**C. C. Fish,** elected chairman of the board. **W. H. Kinnaird,** elected president.

Hysol Corp. — **J. F. O'Brien,** named technical field salesman, Hysol of California Div.

Illinois Tool Works — **S. A. Smith,** appointed general sales manager, Tool and Instrument Div.

Black-Clawson Co.—**J. A. Perry,** appointed sales service engineer, Dilts Div.

Binks Manufacturing Co.—**Wallace Denhoff,** appointed manager, Pump Div.

Thew Shovel Co.—**J. D. Zook,** appointed manager, Product Development Dept.

Price-Watson Co.—**S. H. Simon,** elected vice president.

Ceco Steel Products Corp.—**L. D. Smith,** appointed assistant manager, Steelform Dept.

Eutectic Welding Alloys Corp.— **J. T. Busby,** named field supervisor.

National Tube Div., U. S. Steel Corp. — **J. P. Bacon,** appointed manager of sales, Chicago district.

Jones & Laughlin Steel Corp.— **S. A. Ambler,** appointed assistant superintendent, Strip Sheet Dept., Pittsburgh Works; **C. D. Smith,** named assistant manager, Production Planning Dept., Pittsburgh Works.

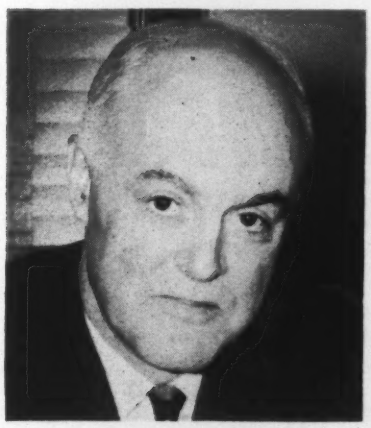
J. D. Rollins, named vice president, facility planning and appropriations, U. S. Steel Corp.

Kennecott Copper Corp.—**F. C. Green,** named assistant to general manager, Western Mining Divisions; **J. P. O'Keefe,** appointed general manager, Utah Copper Div.

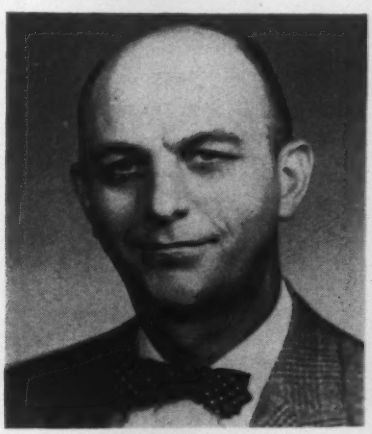
Beloit Tool Corp.—**H. R. Odell,** elected executive vice president.

Worthington Corp.—**C. F. Hendrie,** named utility consultant for

(Continued on P. 146)



W. J. Bennett, elected vice president and director, Iron Ore Co. of Canada.



J. S. Dods, named plant manager, Neville Island Plant of Pittsburgh Coke & Chemical Co.

C. R. Bradlee, appointed manager, cold forming sales, Press Div., E. W. Bliss Co.

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Stroud & Company
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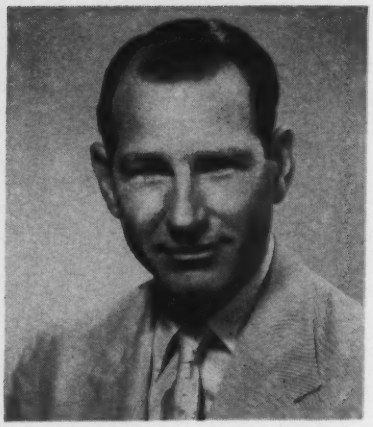

E. L. Argo, appointed manager, sales and plates, Sheffield Div., Armco Steel Corp.

steam power products; **J. R. Matullo,** appointed manager of steam power sales.

Vanadium Corporation of America — **W. T. Fairchild,** appointed acting plant manager of Niagara Falls plant.

The Colorado Fuel & Iron Corp. —**J. A. Keilt,** appointed assistant treasurer.

S. E. Casson, elected vice president, sales, National Acme Co.

Armour Alliance Industries, Coated Abrasives Div. — **J. N. Davis,** appointed plant manager.

Stainless and Strip Div., Jones & Laughlin Steel Corp.—**R. T. Lewis,** named division assistant chief engineer; **E. D. Sevenich** and **R. C. Walton,** named product engineers.

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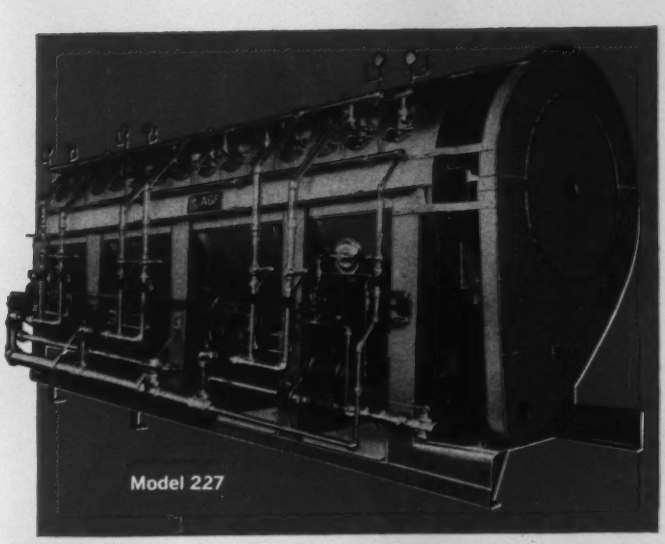

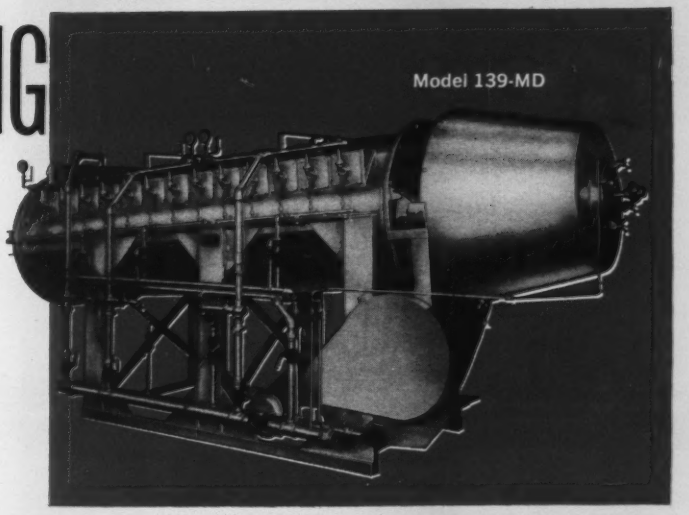

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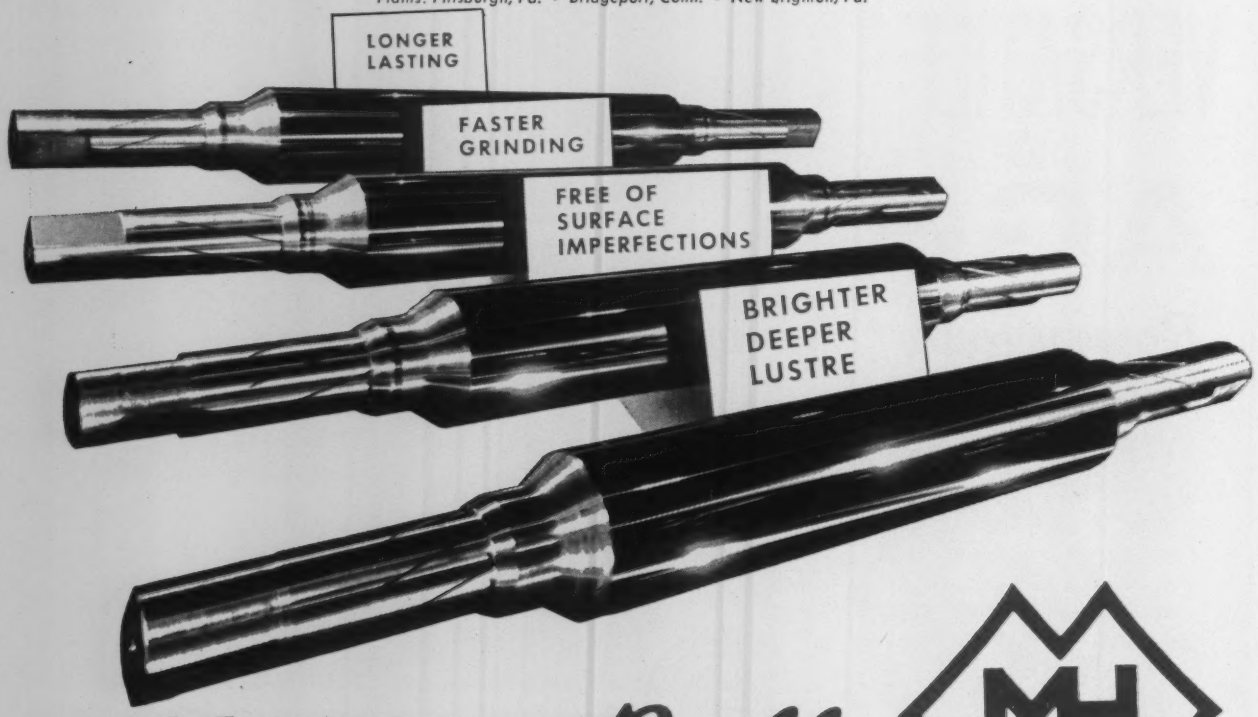
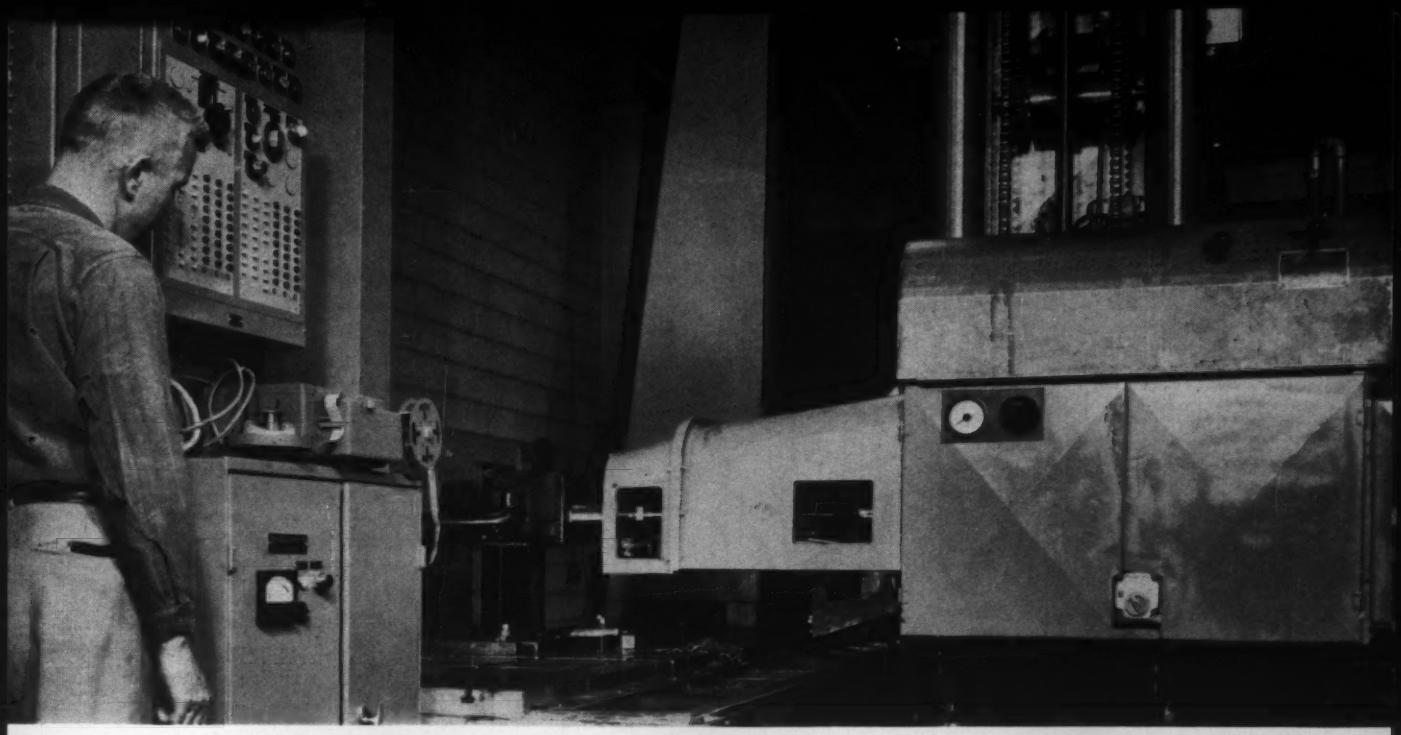


Midvac Rolls

MH



What Can Numerical Controls Do?

Few ideas have caught the metalworking industry's fancy as has control. It's hailed as the answer to many problems.

Yet, a fog of terminology still veils it. Here are the types and the jobs they'll do.

By R. H. Eshelman,
Machinery Editor

■ Application of numerical controls to job-lot machining and fabrication is probably the fastest moving development to hit the metalworking industry. It's possible to get many of the advantages of automated mass production on a small lot basis.

Some of these are: lower labor costs, greater machine use, less tooling, shorter lead time, minimum inspection, greater precision, better parts quality, and smaller tooling and parts inventories.

By comparing techniques used in standard machining practice with those used with numerical control, the full meaning of this development becomes apparent.

What Machinist Does—In normal machining the operator is aided by process sheets, and tooling such as jigs and fixtures. But even after the machine is set up for the job, human

NO. 2 OF A 1960 SERIES

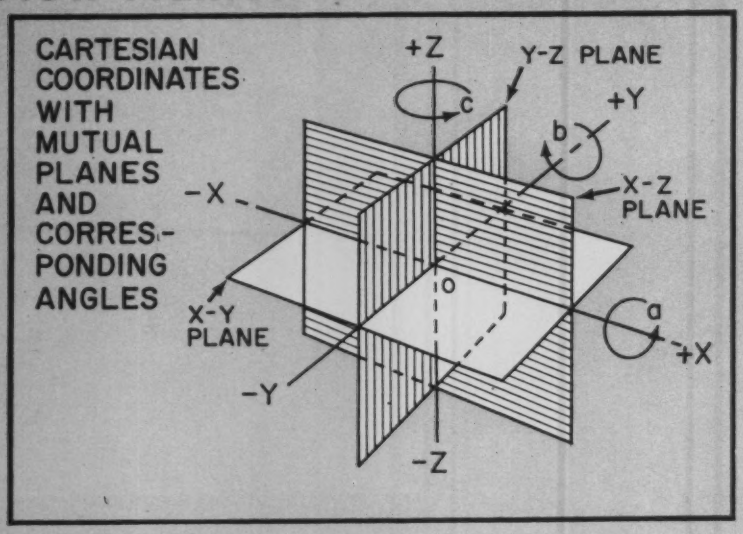
How to Get More for Your Metalworking Dollar

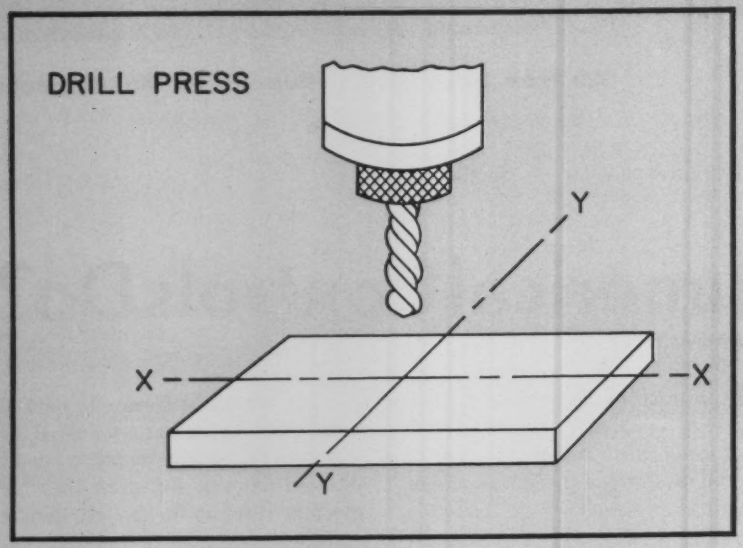
Numerical Controls

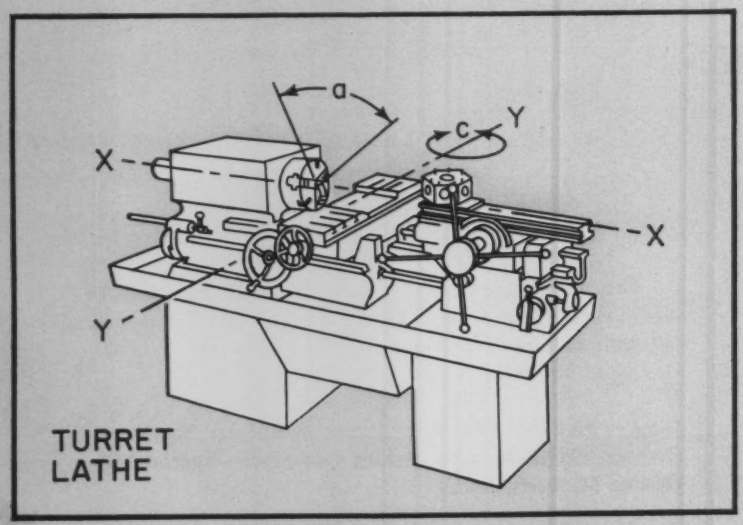
This is the second of six special features in The Iron Age's 1960 Metalworking Dollar Series. The first, dealing with cutting fluids, appeared in the March 3 issue. Others in this series are as follows:

June — **Metallic Coatings;** August — **Special Fasteners;** October—**High-Strength Metals;** December—**Special Machining Methods.**

How Numerical Control Works







COORDINATES PARTS: X, Y, and Z planes locate and describe parts numerically. They are also used for machine axes.

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functions are many and complex.

The object is to make a part of a certain size and shape. The blueprint is supposed to define it. But the machinist still must decide what to do with the blank, and how. He must interpret dimensions on the blueprint into machine motions and cutter paths.

Tape Takes Over—With numerical control there's a vastly different concept. The basic idea is to use numbers to completely describe the part. Feed these numbers into a control medium, such as a punched tape. Then let the tape control the cutter's path.

With this new concept you let the process engineer, aided by computers, if necessary, do all the data preparation. Surveys show that few people can handle masses of numbers well. Reading of blueprint tooling and process data, and interpreting it also allows many chances for errors. Also it's inefficient in terms of machine utilization, and costly in terms of scrap losses.

Improves Data Handling—Thus, numerical control takes responsibility for data handling out of the shop, and puts it in a better environment. This frees the machine from human control factors such as operator fatigue or errors of judgment. Now it can cut at best speeds and feeds at all times.

Usually the process engineer makes the machining decisions. He converts blueprint figures, desired feeds and speeds, and tool information into numerical data. These are transferred directly or by code to card or tape. Interpreted by the reader at the machine, it becomes the machine's commands.

Two Types—There are mainly two types of numerical controlled machines. The first is the simpler. It's known as "positioning system." Or sometimes it's more descriptively termed "point-to-point."

USES EXTRA AXIS: System runs the gamut of simple positioning jobs to complex 4-axis contouring; it can use axis P with tool angle, d.

To describe this system, let's consider a simple drilling operation. We want a large number of holes in a piece of sheet metal.

Our main interest is to locate the part at a precise point for each drilling step. We are not too concerned with the positioning path as long as it's fast and accurate.

With numerical control we simply install a moveable table on the drill press. It is moved in two directions by feed screws and servo drives. We can start the drill spindle automatically once the table is properly placed. This point-to-point or positioning system may also control other machine cycling functions in more complex machines, such as jig bores or vertical turret lathes.

Contouring Systems—The second type of system controls the complete path of the cutter or tool. It's known as "continuous path" or "contouring." A typical use might be for milling a round groove in an aircraft part.

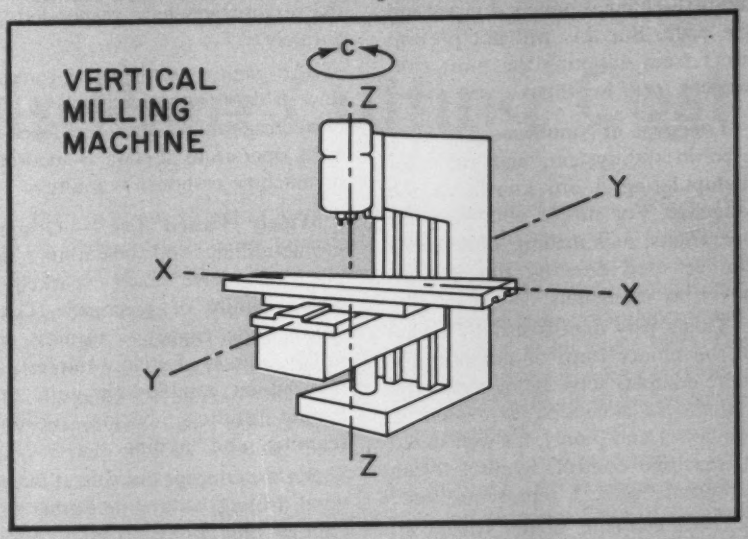
With most continuous path systems a computer is used to calculate the points around a circle. The process man feeds into the computer the data for cutting a circle: its center and radius, maximum deviation from the circle allowed. The computer comes up with cutter offset and a tape to control the machine to produce the circle within the tolerance required.

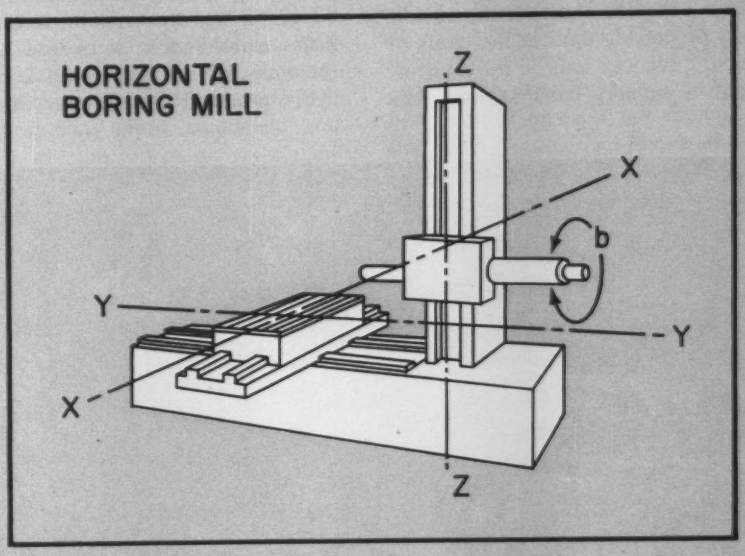
What Medium?—With either the positioning or contouring system, a number of data storage forms are possible. You can have punched cards, magnetic tape and punched tape. Each has good and bad points for particular jobs.

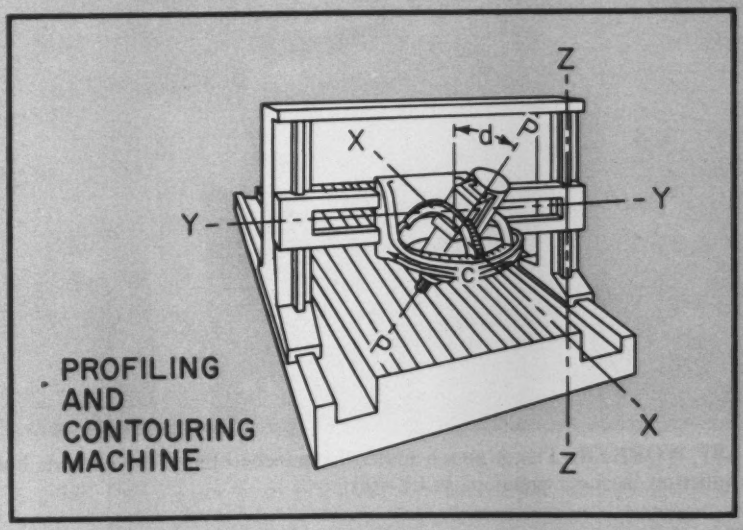
However, it seems desirable for a plant or company to standardize on one form. Thus, only one set of equipment for preparation or programming of the tape need be purchased.

Also, a single system simplifies organization and personnel prob-

Performs Complex Jobs Also







lems. Several groups are currently trying to standardize both the medium (8-channel punched tape) and the code. But this will not prevent users from adopting the most convenient form for them.

Language of Numbers—The code used in the system, and rules for manipulating it are known as the language. For simple point-to-point operations, such drilling, dimensions can be used directly. But it must never be ambiguous.

That's why data is usually coded in the binary form of numbers for more complex jobs. Being a position systems of numbers, expressed in symbols 1 and 0 only, it's well suited to machine control. Symbol 0 can represent "off"; 1 represents "on."

Other elements of the system include a method of converting numerical processing data to the cards or tape; a readout unit on the machine tool; a memory bank to store data until the machine is ready for it; and a built-in gaging system to see that the servo-drives have responded accurately.

The gaging unit gives a running flow of data to the feedback or self-correcting units. This readjusts or halts operations if data is incorrect or machine response is faulty.

Widely Varied Use — Original profile-milling and positioning applications have each sparked a whole family of machines. There are a wide range of turning and milling uses. Lately, interest is focused on combination units that handle milling, boring, drilling, reaming, and tapping.

But the concept has spread far beyond drilling, milling and other machining operations. Contour grinders finish hemispheres or turbine blades to tolerances as close as 25 millionths of an inch. And some highly practical jobs are in other areas: assembly of electronics components, riveting, welding, turret-punching and tube bending.

Tape controls spot-welding of jet engine parts and missile airfoil sections. In fact, numerical techniques are bridging the gap caused by design demands of the aerospace industry and other defense products. The new machines are advancing manufacturing technology to where design can call for "impossible" parts and get them.

Meets the Trend — So developments in numerical control are still coming fast. A positioning system has invaded the area of transfer machining to cope with the trend to custom products. This four-station unit handles a boring and drilling sequence on eight variations of flywheel housings.

Another promising pioneering effort lies in gaging and inspection. Most such equipment so far is aimed at intricate aircraft and atomic energy parts. On some of these it's the only really practical and accurate means of checking; manual methods are too inaccurate and slow.

Another forward step moves to simplify the work of programming parts. One method of path control fits portions of parabolic curves to contours. This type of interpolation allows far fewer points in programming.

Beyond that is a new computer language developed to allow automatic programming (APT). This reduces human error, simplifies a complex job and speeds tape preparation.

Look for Shortcut—Authorities predict another big leap forward growing out of this. Designers thinking in terms of numerical control will allow skipping much of the tooling stage.

Plants would go into numerically controlled production via computer-designed parts and tapes. Even parts drawings might be produced numerically. All the elements have proved out. And the system is said to have worked on some intricate missile parts.

General Electric

FAST WORKER: Turret punch tooled by punched paper tape speeds hole production in sheet metal parts by 400 pct.

How Controls Pare Cutting Cost

Chances are that your shop has jobs that are ideal for numerical machines. The way to find out is to check your cost data.

Here are some comparisions and tips to guide you.

■ How much of the time are machines actually cutting metal in your shop? If you can't answer this question, it may pay to look into it. Machine tools don't earn money when they're idle.

This approach is timely if you're asking yourself whether you can afford numerical control. Surveys show that, in about 75 pct of metalworking plants, products are turned out in lots of 25 or less.

Boost Use Time — Furthermore, the average machine tool makes chips only 15 to 25 pct of the time. A shop's machine cutting time can be revealing in terms of dollars and cents, profit or loss. And it may change your management's thinking about numerical controls.

Numerical machines are turning in utilization records of up to 90 pct. This is so of both simple and complex machines. In fact, point-to-point systems for drilling, punching, boring may afford immediate and obvious gains in general parts manufacture.

Investment Varies — Since the point-to-point systems are simpler, such machines are much less costly than continuous path installations. A simple point-to-point control system may cost as little as $7000. The minimum price tag on a continuous path system is likely to be five to ten times as much.

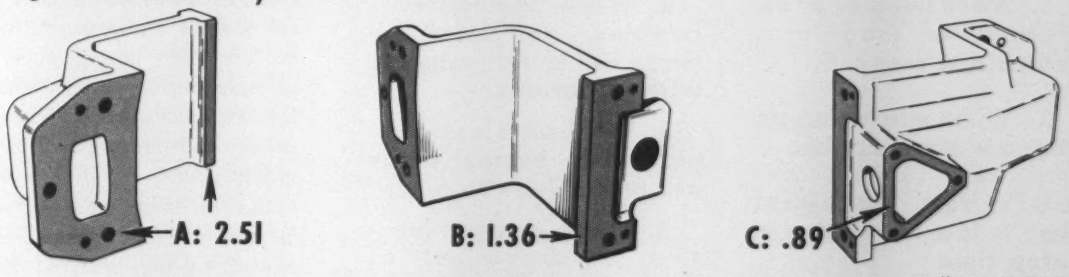
The point-to-point system is easily adaptable to machining where start and stop positions of the tool can be controlled by the tape and the operation of the tool between these two points is controlled by some other means. Preparation of these control tapes is not difficult. The control system can be added to existing machines; holding down the

Rate Step-by-Step Operations for Machine Time

Part No. 36429-A **Numerical Production Analysis** Page 1 of 4

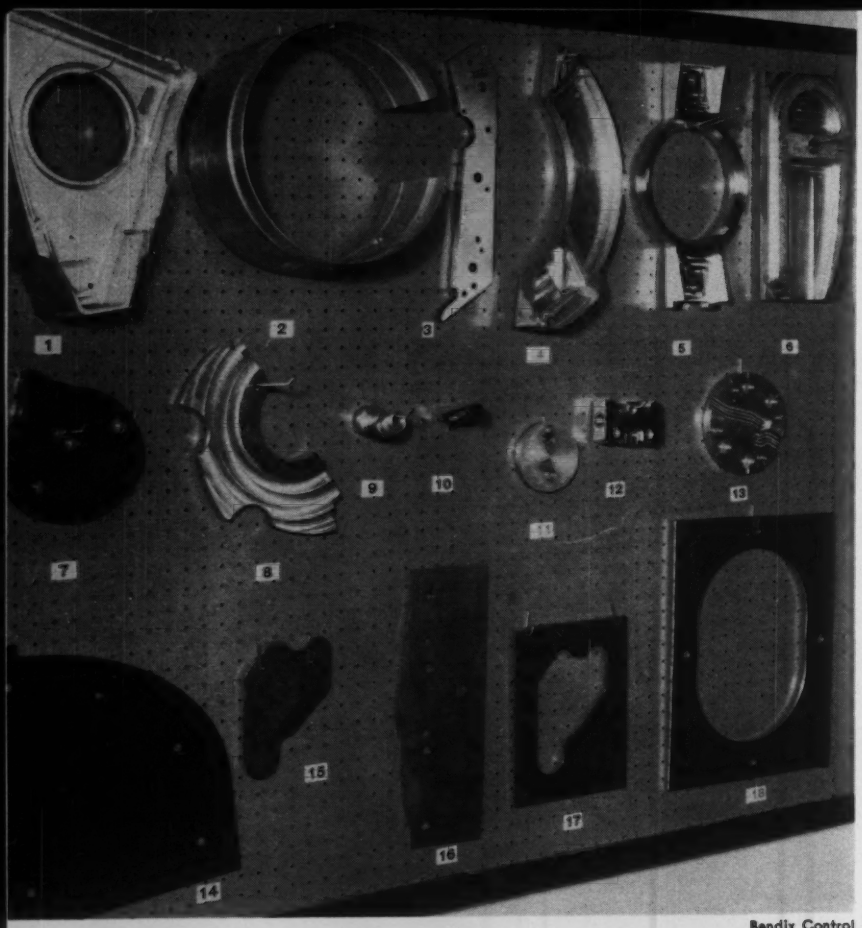
Element Description	Tool Description	Time - Minutes				Remarks
		Tool Change	Table Index	Positioning	Cutting	
1. CHANGE TOOL	2½" SHELL END MILL	.20				5" long -6 Tooth T.C.R.H. (Initial tool change · 20)
2. POSITION to MILL "A"				.07		
		1.70	.78	2.59	10.30	TOTAL CYCLE 15.37 min

Rough and Finish Mill, in Minutes



Kearney & Trecker

SAMPLE PART: Analysis sheet lists machining time for numerically-controlled operations as a guide for cost comparison. Machining this switch bracket took one-third the time of conventional machining.



Bendix Control

CONTOUR AND PROFILE: Parts that can be machined ideally on a three-axis milling machine range from complete missile components to cams.

initial investment.

Contouring is something else. With combined movements of slides involved during the cutting, systems must be more sophisticated. That's why it's so much more expensive.

Spreading Fast — Hundreds of point-to-point machines are already in operation on non-defense work. And they're spreading fast—both in actual numbers and uses.

An eight-spindle turret drill, with a numerical positioning table, drills and taps lots of six motor mounting-plates in an Ohio plant in 126 minutes versus 318 minutes formerly. The job includes 27 drilling, tapping and reaming steps. Besides speeding the process 152 pct, it eliminates a $500 drill jig.

On a large base drilling job for steel mill control equipment, a major electrical supplier in the southeast cuts costs 60 pct with a numerical setup. Each job is virtually custom designed.

How Accurate?—There's a flood of information on accuracy of numerical control systems. Don't be misled. In evaluating equipment you should consider not only the control system's accuracy, but also that of the machine.

System accuracy refers only to the numerical control. But if a machine spindle is not square with the table, and loose in its housing, errors at the cutting point may mount to 0.007 inch.

Potential users should also recognize that cutting tool geometry, changes in workpiece density, temperature changes of both machine and work can result in further errors. What's important to the user is the accuracy of the machine tool and automatic controls working together. He should ask: Will the entire unit give the required accuracy?

How to Justify—Those considering their first venture with even the simplest system are often at a loss to prove how it will pay. Case histories are fine. But what are the cost factors and how can you weigh them?

Accumulated experience gives the clues. Elements are the same as with any capital expenditure. But you need to know how to apply them. In evaluating capital investment, for instance, compare total costs of the present and the proposed manufacturing system.

Include items such as working capital, capital invested in machines, tooling, material handling equipment, floor space, inventory and lead time.

Look At Machine—A good place

When To Consider Numerical Control

1. When number of operations or machining setups are many.

2. When machining operations are complex.

3. When machining time is low in relation to setup time.

4. When lead time must be cut to the bone.

5. When the part is complex, yet must be made in short runs or with variations.

6. When part is so complex that human error are more likely to occur.

7. When design, function or dimensions of parts vary so much that an adequate inventory would be costly.

to start is percent-of-total-available-time your machines spend in actual metal removal. Automatic operation and preplanning should allow you to increase this factor substantially. The downtime is cut. And utilization moves up and holds at a constant figure.

The operator's function becomes one of machine supervision. Thus, production control is simplified. Management of machine operators is replaced by more predictable management of machines.

There are other gains: Elimination of inventory of parts in process; a lower materials and product inventory; less expensive floor space and lead time; and flexibility in machining operations.

Analyze Typical Parts — Other factors, such as tooling, scrap, salvage, rework and inspection time offer more direct estimates with present methods and costs. Briefly, a four step analysis can be based on the accompanying form.

First, select a sample of parts from your production. Second, estimate the production time by numerical machining. Third, determine yearly savings over present methods. Finally, determine investment recovery period for the equipment under consideration.

How to Choose—Look at a number of points in selecting workpieces. They should be representative of work handled on the machine. Also try to reflect future production. Lot sizes may vary from one to several hundred.

As an example, we have a multipurpose tape machine with automatic tool changing. On such a unit we're able to take a middle range of castings, forgings, weldments. Machining operations include combinations of milling, drilling, tapping, reaming, boring and counterboring. Parts analysis should bring out data on present costs of setup, tooling and lead time, inventory and handling.

Compare Time—Once you've determined actual production times under your present method, you're ready to estimate time for numerical control methods. From available information, an experienced tool engineer or process man should come up with fairly accurate data.

After calculating savings, your firm's investment formula will give the length of the payoff period. In many instances, turret punches, drilling machines in the $35,000 to $50,000 class show an investment recovery in as little as a year. More expensive and versatile units can often justify their cost within a three-year period.

Comparisons Show Savings

Door Hinge Casting

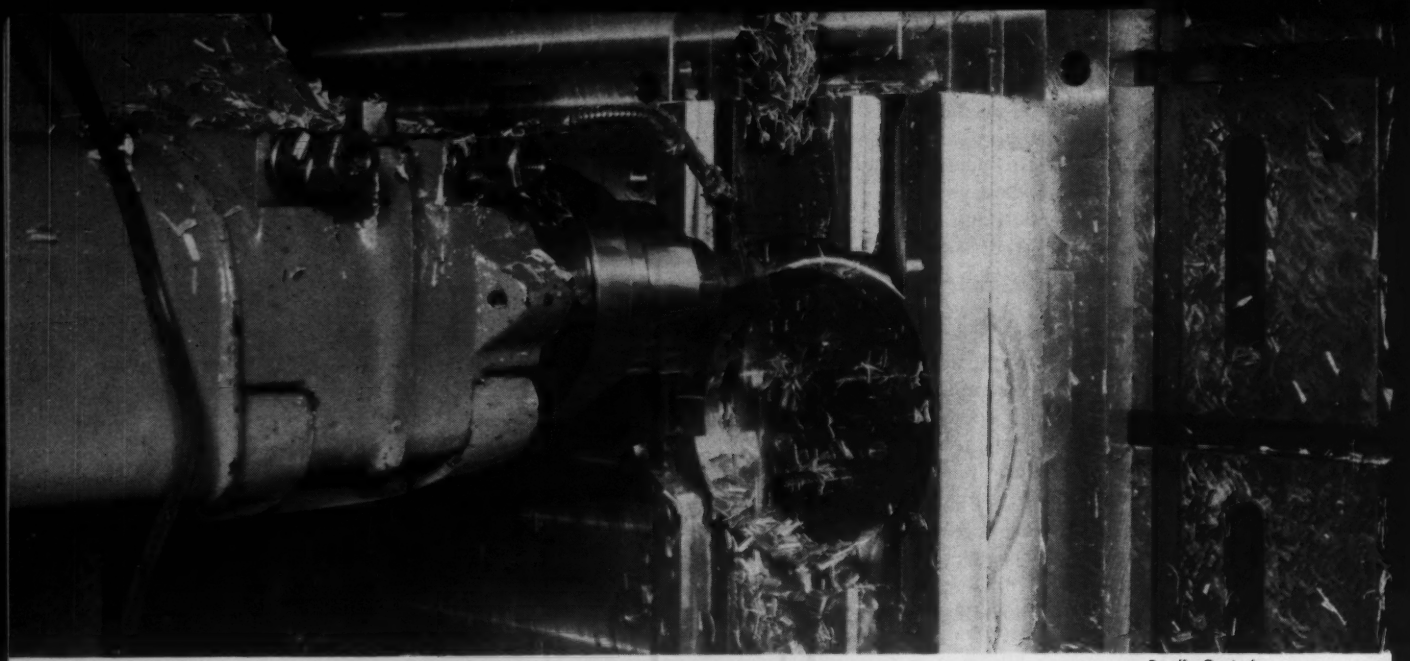
	Numerical Control	Tracer Control
Boring fixture design	0 hours	20 hours
Boring fixture manufacture	0	50
Holding fixture design	23	16
Holding fixture manufacture	48	40
Profile template design	0	24
Profile template manufacture	0	80
Process sheet preparation	16	0
Process tape preparation	4	0
Computing time	1	0
	92 hours	210 hours
Setup time	1	3.75
Machining time	1	1.75

Honeycomb Die Cavity

	Numerical Control	Conventional
Planning	16 hours	8 hours
Calculating	40	20
Tape preparation	12	0
Loft drawing	0	40
Station master template	0	30
Plaster mold template	0	42
Rigging template and fairing	0	80
Plaster splash	0	80
Male casting from plaster splash	0	100
Cast metal die	0	110
Machining die	24	0
Finish grind die	30	60
	122 hours	550 hours
Lead time	3 days	7 weeks

Tape Control Drilling

	Drill Plate	Drill Jig (Box—200 cu. in.)	Tape Control
Initial cost	$200	$450	$5–10
Cost of rework, maintenance and storage	$100	$250	$10
Average tool cost per part—20 PC	$15	$35	$.75–1.00
Average tool cost per part—1000 PC	$.30	$.70	$.02
Average run cost per part	$.10–.50	$.20–.75	Comparable or better
Hole precision	±.002–10 in.	±.002–10 in.	±.0001–.002 in.
Tool fabrication or rework span	2–8 weeks	2–10 weeks	1 day



Bendix Controls

FAST WORK: Three-axis numerically-controlled miller turns out magnesium hub reflector support for radar. Two setups do job in 2 hours 20 minutes per piece vs. 40-80 hours for previous method.

Putting It Over in Your Company

Key to a successful numerical control program is total organization support.

Each link in the chain is important: management, engineering, programming, production and maintenance.

■ Ask a dozen authorities what is the most important element in putting across numerical control and likely you'll get a dozen answers. Which is most vital: management support, engineering, planning, programming, tape preparation, shop supervision, operators, service or maintenance?

Like any chain, a weak link anywhere can break it all. This means that an organization must be sold from the start, top to bottom, if you're to realize full potential.

Any serious thought about numerically controlled machines quickly erases most doubts about their superiority over manual operations. And in the first years in production, numerical control has achieved truly dramatic dollar savings in metalworking costs. It has made new designs feasible for the first time—such as jet aircraft wing skins with integral supports.

Practical Era — Now numerical control has entered the stage where even the small user can approach it confidently. But he must be prepared to accept the total concept.

He can do so if he is willing. He already has most of the basic knowledge and necessary skills within his organization. Further information, training and help needed are readily available, too.

To be successful, the user must realize that he's not simply adding a control to a machine. The two are inter-related and dependent. They must be considered a system.

More Advanced — The system shifts planning the machining job into the engineering area. That's where it logically belongs. While designs and parts manufacturing become complex, more precise quality and reliability requirements move up. Operator skills are simply not keeping pace. More efficient planning, execution are needed.

The answer is in numerical methods of planning and programming. Formerly functions of determining manufacturing feasibility, procedures and carrying out the final production were divided between tool engineering, the process man, tool designer and the shop foreman.

Now they are unified. Planning takes over the additional responsibility for actual instructions to the machine.

Biggest Step—When he realizes these facts and prepares his organization to live with them, the user has taken the biggest, most important step in getting ready for profitable use of numerical control.

This preparation takes many

forms. For management, it's perhaps a short briefing by experts—his own or from outside—on what to expect from numerical control.

Systems Supervisor—For the man selected to head up the new programs, a complete grasp of the functions is a must. He needs the technical background to make it go, plus the best numerical control training he can get.

It's apparent that every user will be making a sizeable investment in numerically controlled equipment. In view of the rapid rate of return, if it's properly used, the small additional investment in preparing a man for this function just makes good sense.

Shop Support — Some potential users raise questions about union resistance to this new equipment. Selection of right kind of operators and maintenance personnel can clear this hurdle. They have to be forward looking, willing to accept change and the challenge of something new.

With thorough background preparation and training approach these fears seldom materialize. Objections are usually based on misunderstanding and lack of communication.

Where proper explanations are made in advance, a new user can expect complete cooperation from everybody: operators, maintenance personnel, shop supervision. The system should be offered for what it is—something different.

New classifications, when called for, should be set up. Then plants find they really have no great problems.

Overall Gains — There's something in numerical control for the entire organization. A big point is the improvement in quality, bettering of competitive position.

Management can take advantage of a more scientific approach to manufacturing. With less lead time to comtend with, product changes are quicker and easier. Planning and scheduling becomes more accurate and realistic.

Language of Numerical Control

Analog—Varying voltages or voltage ratios; not precisely measurable quantity or dimension.

APT — Automatic Programmed Tool; a new alphabetic language for putting machine instructions into computers, simplifying job of programming complex contours.

Axis—Basic machine motions represented in terms of Cartesian coordinates: X, Y, Z.

Binary — Numbers system based on only two symbols 0, 1, (off, on), and depending on their position and repetition.

Channels—Paths or rows of information along a punched tape, magnetic tape etc.

Closed Loop System—Control system with output fed back for comparison with input to give self correction and full automatic control.

Code — System of symbols (usually numerical) for expressing instructions to computer or machine.

Command—Pulse, signal or set of signals initiating one step in computer or machine operation.

Computer Routine — Set of precoded instructions used for operations or instructions that reoccur frequently.

Continuous Path — Contour control, as for profile milling .

Cutter Compensation—Automatic adjustment factor making allowance for using cutter other than nominal size.

Data Processing — Procedure of transforming engineering and manufacturing information as taken from part blueprint, into suitable numerical, coordinates or other coded form for machine control.

Digital—From "digit" single whole number, i.e. countable electric pulses.

Director, converter, interpolator—Computer-type device for automatically changing machine instructions from one form to another, adding routines, etc.

Discrete — See digital. Also used interchangeably for point-to-point, positioning system.

Feedback (self correcting)—Used on control system where flow of output information back to control allows automatic adjustment, as of machine table position.

Input — Machine instructions in control form, i.e. on punched or magnetic tape, cards etc. Also the device performing this function.

Manuscript — Basic process sheet with manufacturing information in numerical form: tool path, cutting sequences, work location, feeds, speeds, etc.

Mode—Method or procedure used, as "computer mode."

Memory—Device or portion of system that "stores" commands until needed.

Open Loop System—Control without means of self-correction.

Positioning System (point-to-point)—Discrete automatic control of machine table or head between locations, as centerlines of holes.

Program — To analyze and prepare machine instructions in numerical form.

Pulse—Abrupt change in voltage or current, and return to original level.

Retrofit—To modify an existing machine to fit it with a numerical control system.

Servomechanism — Electrical slave unit to translate control pulses into machine actuation, as precise movement of table drive screw.

Visual Readout — Dimension of process sequence or other operator information appearing on console face.

Zero Shift—Movement of locoating or starting position to correspond with relative location of part in the machine setup.

Tooling: Its Care and Use For Greater Production

Tape replaces much of the usual tooling. But you still need cutting tools and workholding devices.

There are differences, though. Watch out for them.

■ Tooling is always a problem. How much and what kinds do you need? Although numerical machines can't do without tooling, they can ease problems and speed the tooling stage.

Control tapes, punched cards or other media are really part of the tooling. They control the cutting tool. On positioning jobs they take the place of such tools as drill jigs. On contouring, they replace an even more complex chain of tooling.

Time Varies—Positioning tapes may take only a half hour or less to make. On the other hand, a complex root rib for a missile lists seven and a half hours' cost for tape preparation, and 144 hours of planning or programming. This compares with 150 hours of template design and 250 hours for template making.

Usually, if a part is suitable for numerical machining, tooling is simpler and less costly. Ordinarily basic workholding fixtures and cutting tools are all you need.

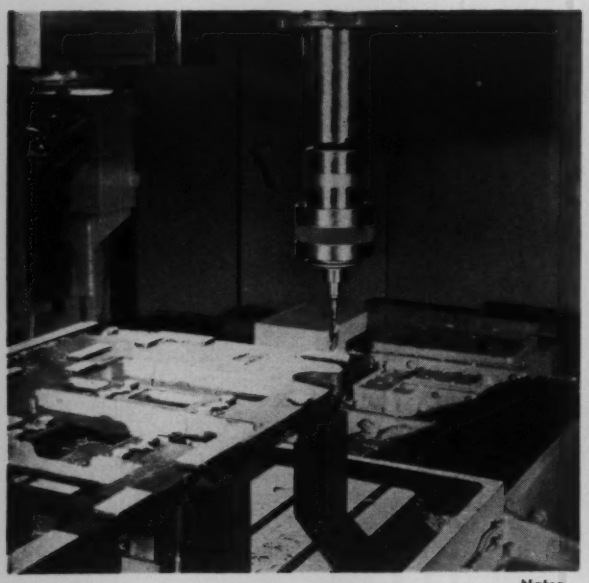
Setup Simplified — Because the setup at the machine is simplified, many users of positioning controls say they meet few problems in tooling. Of course, jigs and fixtures should be suited to the operation. But a good tool room can handle this.

The actual cutting tools should be chosen and handled with care. They should be precision ground and protected to their point of use.

Special Problems—Contour machining, being more complex, brings its own problems. Care is needed in design of fixtures to avoid some pitfalls. One of these may result from too many jobs being handled in a single chucking. That's warpage.

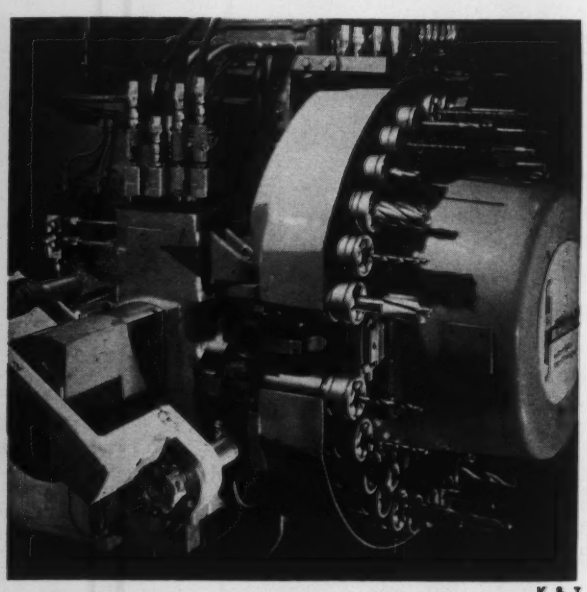
Usually this occurs when released from the holding fixture. Warpage may be caused by removing stock from too large an area without heat treat or stress relief.

Other Factors — Variations in cutter and workpiece material still occur. That's when deflections result. Your next step? Reduce feed. As a result, many contour machines contain setups for manual override on the feed rate.



Natco

SIMPLE SETUP: Tool in numerically-controlled drilling machine is chucked in quick-change holder.



K & T

TOOL CHANGER: Rotary tool chamber for multipurpose machine holds 30 different cutting tools.

It's just about impossible to predict to what degree workpieces will prove. If the cutter dulls somewhat, it's best to be able to finish the part at a lower rate.

Tool Compensation—There are two schools of thought on the matter of building tool compensation into the system. One school includes it. The other does not. Both methods seem to work, though.

On systems that have this provision, milling cutters do not have to be ground to exact radii for which the job is programmed. The system compensates some differences in cutter size. The operator simply dials the difference from the nominal.

In contrast, the other school feels that since tools normally are provided for every job, exact tools can and should be used. This avoids bringing in another variable. When a cutter changes size through wear, it will hardly give surface finish for the final pass.

Bonus Added—Several features of numerical control further aid tooling flexibility. One of these is zero shift. With it you can move the starting point anywhere on the worktable.

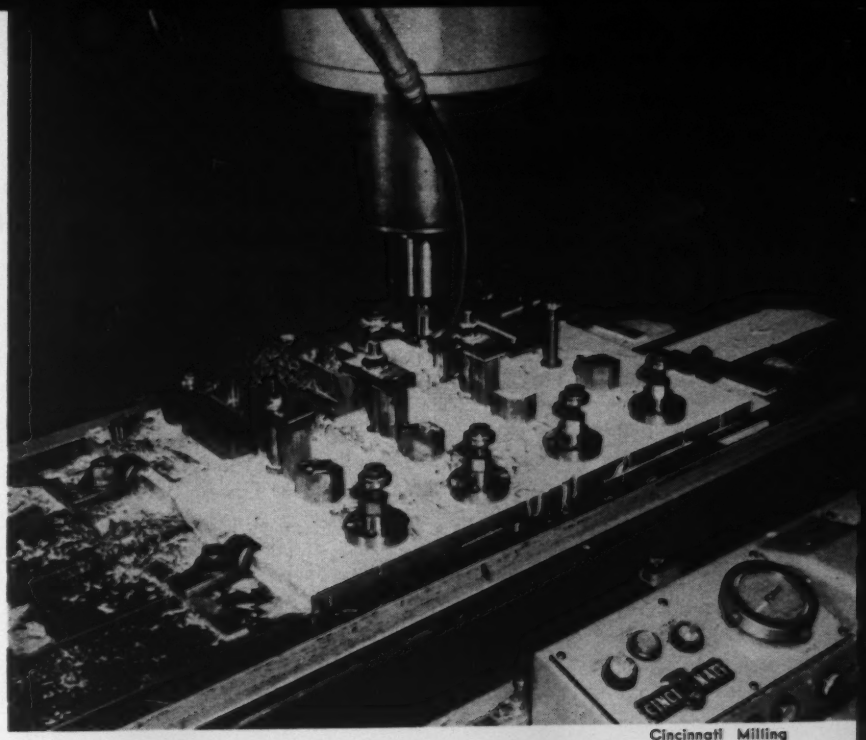
Duplicate parts can be located anywhere. The operator de-clutches the system, then moves to a new zero point to machine the other pieces.

Another technique is "mirror control." This is a circuit often provided for reversing each axis or direction of machine motion.

Quick-Change Helps—In tooling numerical equipment, study the benefits of quick-change tooling. In production work, vacuum chucks will help speed loading.

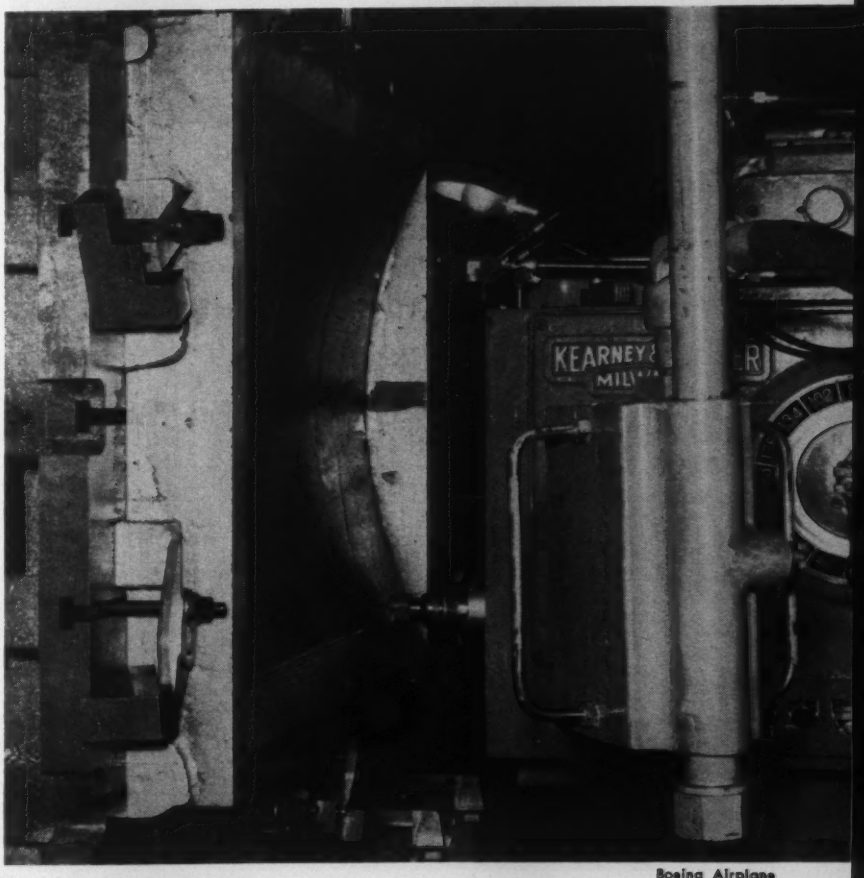
Drills can be chucked in quick-change tool holders. Tools for multi-purpose machines can be preset. There's a trend toward automatic tool changing, too.

Drilling machines are now available with depth control. The programmer can program for tools of random length. He need only know the length of the tool in its holder.



Cincinnati Milling

MIRROR IMAGE TOOLING: As four spoiler hinge forged blocks are machined on back side, operator loads front with opposites.



Boeing Airplane

PROFILE MILL IN ACTION: Female half of bonding assembly is jig machined on tape-controlled profile mill.

Match Maintenance to Machine

Maintenance of electronic equipment is one of the bugaboos of the shop. It needn't be.

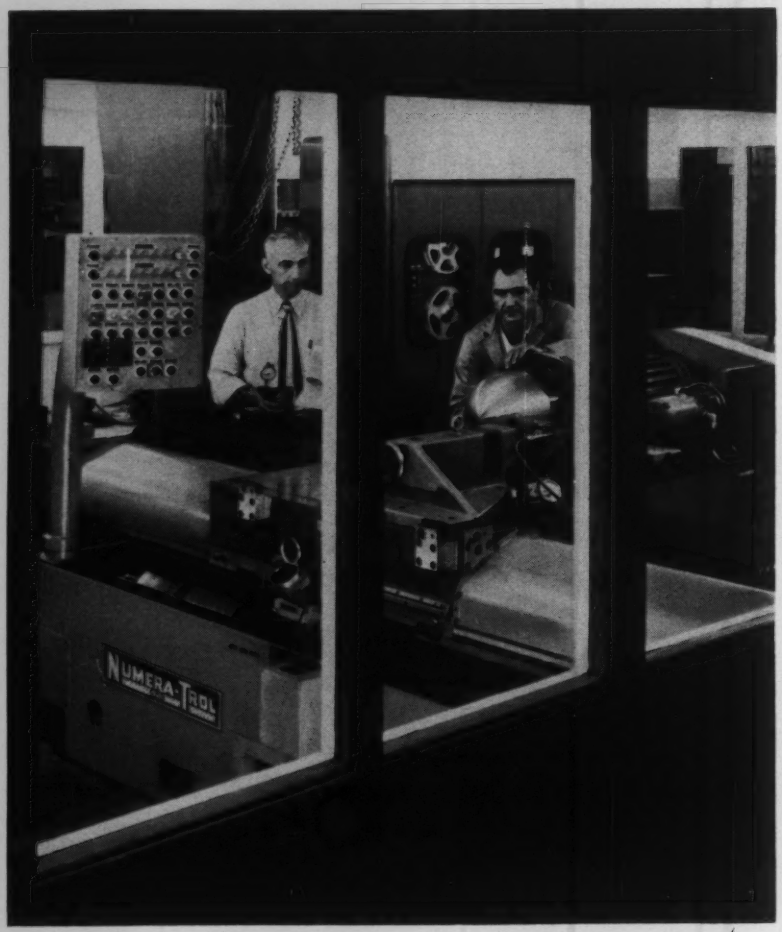
Planned preventive maintenance can keep numerical machines running and delivering as expected.

■ Hit or miss maintenance won't do for numerical machines. It's got to be a scheduled program of service, matched to the needs of the machine and control system.

First, numerically-controlled machines have a higher operating rate. Second, they're more automatic; you can't expect the operator to catch faulty operation before damage occurs. Third, because of higher cost and higher operating rates, downtime is more expensive. Usually, numerical equipment handles the tough, precision jobs.

Experience with complex installations shows most fears of trouble with numerical equipment are unjustified.

Ex-Cell-O



PRECISION ENVIRONMENT: For precision to 0.0001 in., hemisphere production takes place in temperature controlled room.

Where Service Shows—Once in operation, electronics and control equipment on numerical machines accounts for less than 5 pct of total downtime. In the break-in stages, troubles come largely from unfamiliarity with the equipment.

Among the first parts produced, 80 pct of errors are due to the control medium. These are flaws in planning, programming and typing the tape. Errors caused by the operator account for 2 pct; 7 pct are cutting tool troubles; 10 pct in workholding fixtures, and only 1 pct are caused by malfunctioning of tooling and the system.

After the equipment proves out, rejects and downtime drop drastically. But sources of errors change. They are distributed as follows: controls—10 pct; operator—45 pct; cutting tools—30 pct; fixturing—5 pct; system and tooling malfunction—10 pct.

Typical of performance, on a jig grinder, once operations were debugged, only 3 pieces in a lot of 1000 parts were rejected. These were for slightly oversize holes.

How to Prepare — Tailor-made maintenance people are hard to come by. But, fortunately, most numerical equipment is designed for easy shop service. Plug-in units and panel test lights help. A man with some understanding of electronics can pick up service information quickly.

Accept the fact of more specialized maintenance. Pick the right personnel and train them. But fit the scope of the program to the installation.

The equipment supplier can guide you in reducing wasted motion. Besides training personnel, he will furnish service schedules for the mechanical, hydraulic and electronic systems.

Experience with complex systems in the aircraft and missile field

shows that planned maintenance pays. Most downtime occurs in the first six months.

Cut Downtime—Too often it's this area of servicing that's taken for granted by management, and operating personnel in supervision. Regardless of how carefully the installation is planned, this preparation is wasted and potential savings dissipated if the machine is down for long periods.

Maintenance, too, must be planned. Preventive maintenance is not preventive unless it's systemically controlled.

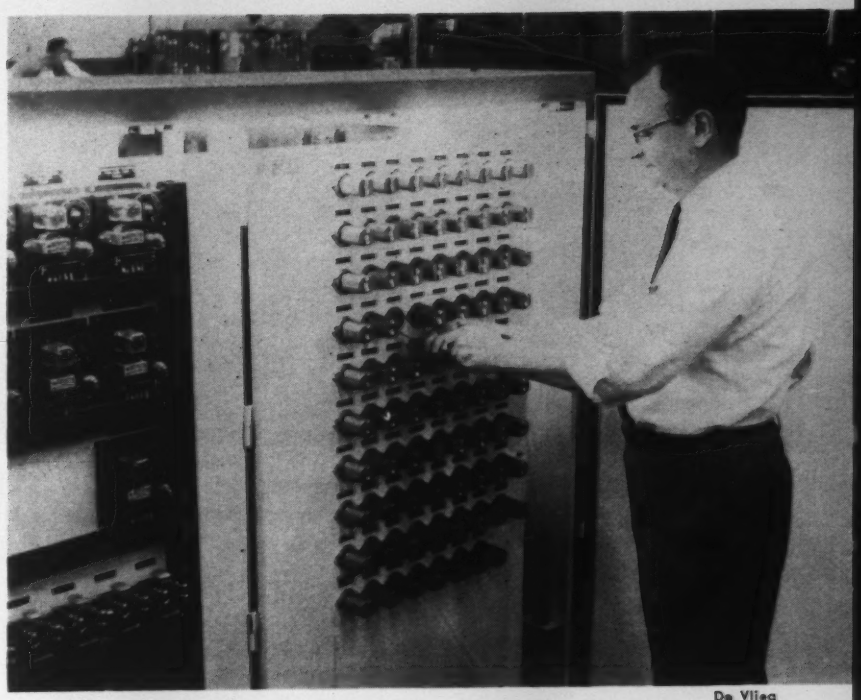
Although maintenance problems are not radically different than on much automatic equipment, a somewhat novel approach is necessary.

Relative importance of electronics is increasing gradually. And this goes hand in hand with greater mechanical complexity. So the role of the maintenance department is correspondingly greater.

An eventual trend may be sharp reductions in direct manpower, virtual dependence on maintenance to keep machines running.

What's Needed — A preventive maintenance program requires check sheets for the electronic hydraulic and mechanical systems. In addition, you'll want a list of spare parts, at least for those most subject to wear. Electronic test equipment is a must. Also, a relatively small investment in special and general purpose check-out equipment will save time in probing for sources of the trouble.

In the shop, it's desirable to use an initialed service form. This avoids difficulty regarding responsibility. During installation, it's desirable to have maintenance men work directly with field service representatives and thus gain valuable debugging experience.



De Vlieg

PLUG-IN MAINTENANCE: Two spare units service this boring machine control panel. Test lights pinpoint sources of trouble quickly.

How It Works—In one leading aircraft firm, the maintenance program is divided into a series of periodic reviews. First is the operator's daily inspection and check-off. This covers oil levels, way covers, heat of spindles, motors and casings. The maintenance department checks mechanical, electrical, electronic and hydraulic elements on 30 day, 3 month and 6 month schedules.

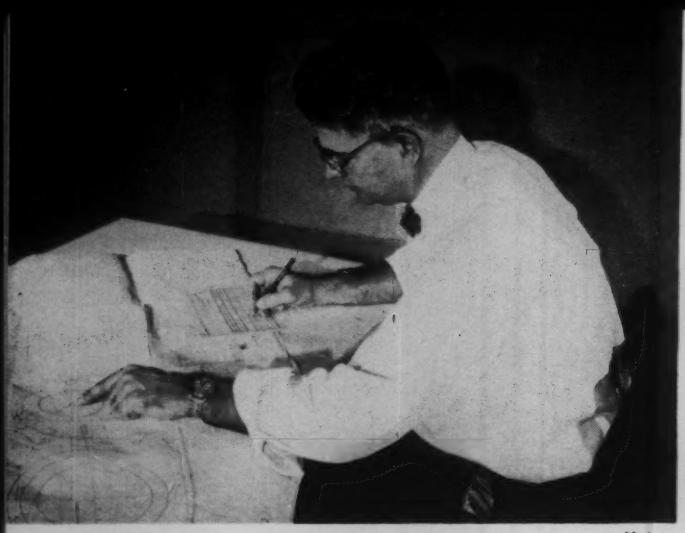
Lubrication is a very critical factor on numerical machines. It's easily overlooked. Scored ways, spinddles that seize, and other serious troubles have developed from inadequate programs.

Service contracts help to assure prompt and efficient handling of breakdowns. This firm's record shows that they're most beneficial during early operation. Once maintenance people become more familiar with equipment, service calls taper off.

Control Unit Checkpoints

Daily checks should be made on the following:

- ✓ **Observe power supply sequencing**
- ✓ **Operation of machine control unit ventilation**
- ✓ **Operational test at normal clock, clamp and shift current**
- ✓ **Water supply to heat exchanger**
- ✓ **Hydraulic oil level**
- ✓ **Hydraulic pressures of system**
- ✓ **Servo amplifier differential current (before selecting feed power)**
- ✓ **Operation of machine in manual mode**
- ✓ **Hydraulic oil temperature of 30 minutes of operation**



Natco

First **CONVERT:** Programmer converts blueprint data to X and Y coordinates; adds speeds, feeds and other directions.

Fosdick

Second **TYPE:** Typist punches tape on Flexowriter, taking information directly from operations chart prepared from blueprint.

Efficiency Stems From Planning A Well-Rounded Program

Success in this new field hinges on getting off on the right foot.

You must plan properly and organize effectively to gain full benefits.

■ Many smaller plants are dropping tape-controlled machines into their shop operations with scarcely a ripple. Others are beset with troubles. They run the gamut from service and maintenance to sticky labor grievances.

Planning and preparation make the difference. Management must recognize that the numerical concept is broad in scope. It's more than just another piece of equipment.

One big roadblack to maximum benefits is mental. It's the failure to comprehend both the advantages and limitations of the system. A full understanding often takes basic changes in attitude and a real perspective of how numerical control will affect the total organization.

Big Transition — Like the airlines' switch to jets, the new technology may be viewed at first with skepticism—then eagerly embraced. And, any transition produces problems.

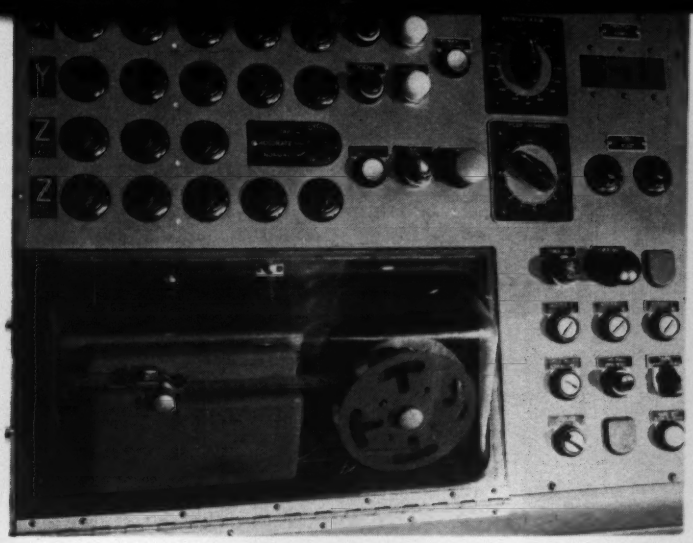
Restudy of the entire production scheme in terms of money, manpower, materials and management as well as machines is a good kickoff point. Integrating the new system involves accounting and finance, new worker skills, new materials handling techniques and new production methods.

Must Educate—The major problem boils down to one of education. You have to train your people to know how to handle information in processing. Operating personnel must grasp outlines of this processing procedure.

Also, you must train your maintenance men in a system which will keep the equipment operating. So it means an upgrading of skills, and having processing people and machinists think and work in the engineering area.

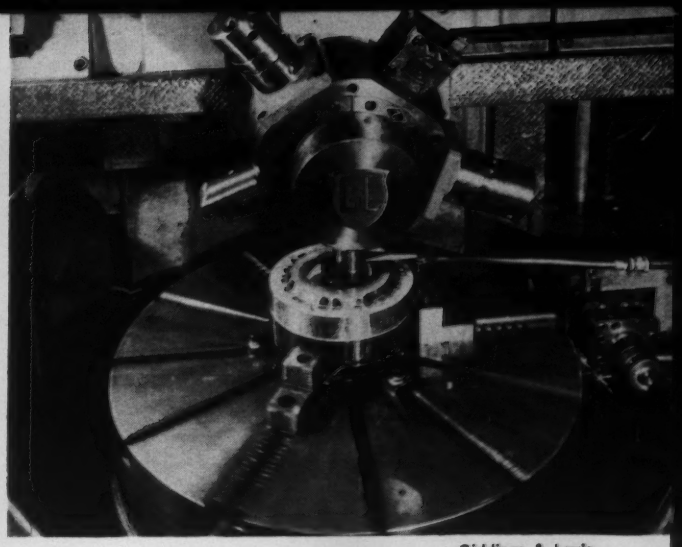
If it's a small machine and simple unit, preparation and training can be on the same scale. More complex systems take bigger plans.

Work as Team—Form a committee of key people from the departments most affected: production; plant engineering; production control; tool, industrial and manufacturing engineering. Also include operators, processors and programmers. This group becomes your nucleus of experts on numerical control through study, attending technical meetings, visiting other installations and further training.



Natco

Third **TO CONSOLE:** Tape is then placed in console and is ready to feed commands to machine. Dials allow manual control.



Giddings & Lewis

Fourth **MACHINE:** Commands from tape put machine in motion. First two pieces paid for tape preparation from savings.

This planning begins as soon as the decision is made to go ahead. Most users find the necessary skills within their own ranks. But the jobs are new and different.

Key personnel are those for planning the machining program. You'll need a man with a good knowledge of metalcutting and geometry. Some plants train tool engineers. Others find that their best machine operators can handle the job. But if contouring is involved, a mathematician is desirable to handle the computer work.

Operators should be selected carefully for special and expensive equipment. It's important that they have no prejudices against working with new equipment.

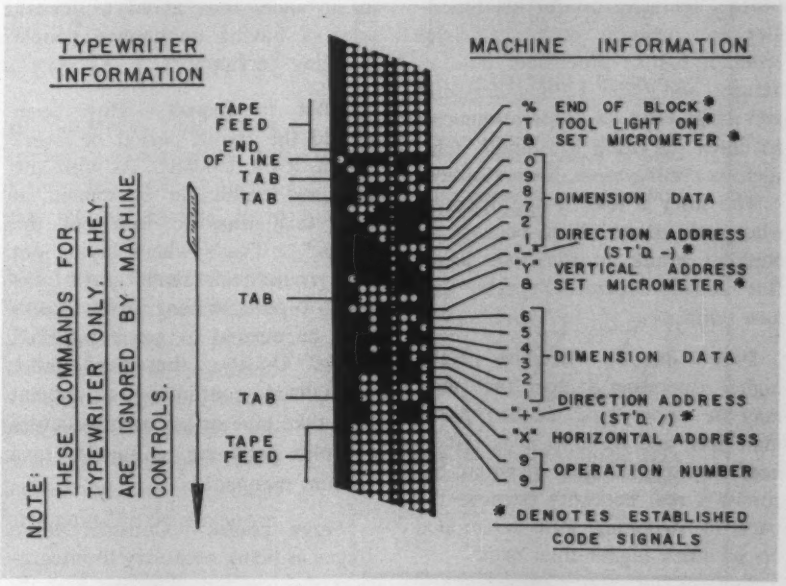
Stress Maintenance — With emphasis on unfamiliar equipment, maintenance people need to be well trained and highly competent. It may be well to select those with some electronics background and good mechanical ability rather than train them. Since most suppliers of controls and machines have regular training courses, this is generally no problem. Experienced typists can usually pick up the actual typing of the tape in a few hours.

Plan Installation — Location of numerical machines is important for integrating with present facilities. For instance, most numerical installations take more floor space than similar conventional machines. However, since their output can match that of two or three other units, there's a net gain in area.

Make room for additional numerical units. Check conditions such as foundation, temperature, drafts and sunlight. If these things are done well in advance, installation and setup time will be short.

Have Parts Ready—Purpose of planning and preparation is to be sure parts are ready to go on the numerical machine as soon as it can take them. It may be foresighted to have the first parts programmed by outside experts—per-

How Tape Stores Data



EIGHT CHANNELS: This standard eight-channel tape shows the type of data that's recorded on it. It can be plastic, paper or other material.

Boeing Airplane

SOLVES TRYOUT: This drafting-verifier checks out programming of 3-D path systems. It draws three views of parts along cutter centerlines.

haps as part of training of your people.

True, make-ready requires more than normal coordination. Suitable parts, and operations must be chosen; tentative production schedules set; tapes prepared; material ordered; blanks processed; holding fixtures and other tooling designed and made. But all preparations can go down the drain if a single item, such as cutting tools, is overlooked.

The story is told of one operator who could never adjust, because he couldn't crank in his own ideas. But usually operators prefer the new units.

Pace Goes Up—Because of the higher operating factor, the plant may be unprepared to feed parts, materials, and tools to it as fast as needed. Special tool dispatch becomes a real necessity because the pace in switching jobs is stepped up so much higher than usual.

Too, in the matter of personnel, difficulties can crop up. Take job classifications, for example. Experience to date shows that it's best to set up new ones. Some shops have run into labor problems, especially in maintenance. Don't fail to clear with union representation in advance, thus avoid a ticklish snag of having unqualified people handling servicing.

What to Expect — How soon should the tryout period be over? Again, it all depends. As with any new and unfamiliar equipment, it may take time to iron out the "bugs." That's where laying out the groundwork really pays. On point-to-point drilling, a few weeks may be needed to get it into full swing. On the other hand, more specialized contouring equipment may take nine or ten months before complex parts can be handled in a routine manner.

Three Stages — Consider three stages as being necessary to integration of the system. The first is study and planning. In that, you spotlight problem areas, looking into tooling and inspection. Plan thoroughly how to prepare cards or tapes. Then, prepare for training of personnel and maintenance of equipment.

In the second stage, you actually introduce the live equipment. You get it going, work with it, and evaluate the results you're getting. This can be called the "tryout" period in which you're still feeling your way and smoothening out the wrinkles as you go along.

Finally, you look for full exploitation of this new technology. This is the stage in which you begin to realize a return on your investment and put the equipment to its most efficient use. It's also the time when you look for new jobs that can be done more readily on numerical machines than on conventional manually-operated equipment. In other words, it's the pay-off period.

Acknowledgments—The editors are grateful to the many individuals and companies for helping to make this feature possible. Special thanks go to: Aerospace Industries Assn.; Battelle Memorial Institute; Bendix Aviation Corp.; Boeing Airplane Co.; Brown & Sharpe Mfg. Co.; Burg Tool Mfg. Co. Inc.; Cincinnati Lathe and Tool Co., Cincinnati Milling and Grinding Machines, Inc.; Detroit Diesel Div., General Motors Corp.; DeVlieg Machine Co.; Ex-Cell-O Corp.; Fosdick Machine Tool Co.; Specialty Control Dept., General Electric Co.; Giddings & Lewis Machine Tool Co.; Gisholt Machine Co.; Walter P. Hill Co.; Hughes Aircraft Co.; International Business Machines Corp.; Kearney & Trecker Corp.; Magnasync Corp.; Massachusetts Institute of Technology; National Automatic Tool Co.; Pratt & Whitney Div., United Aircraft; True-Trace Corp.; and Warner & Swasey Co.

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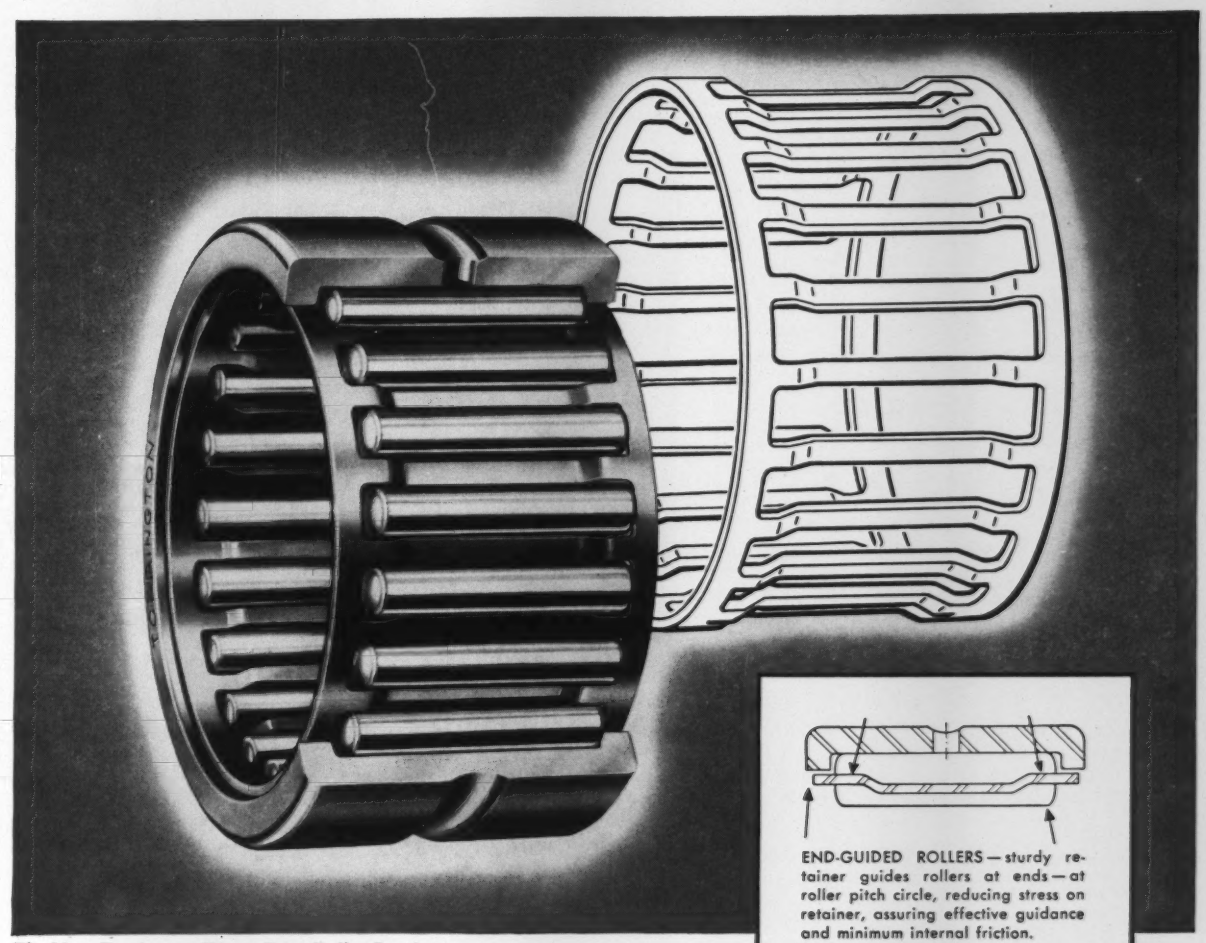


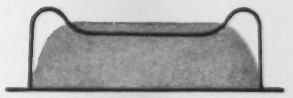
The New *Torrington Heavy Duty Roller Bearing*

Key to Long Life... Roller Guidance Where It Counts!

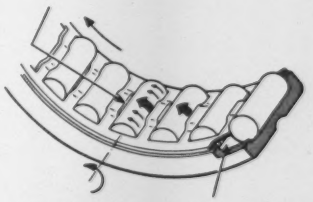
This sturdy flange-riding retainer in Torrington Heavy Duty Roller Bearings insures the highest degree of roller guidance where it's most effective... at the roller ends along the pitch circle. You get outstanding service life through minimum internal friction, high roller stability and efficient lubrication.

Controlled contour rollers prevent high end-stress concentrations. Careful heat treatment of the channel-shaped outer race insures high shock resistance. The Heavy Duty Roller Bearing has proved successful under unusual conditions of deflection or misalignment. Torrington Heavy Duty Roller Bearings are giving longer life in such difficult applications as two-cycle engines, hydraulic pumps, oil-field equipment, sheaves and transmissions. For design and application assistance on the Heavy Duty Roller Bearing—and every basic type of anti-friction bearing—call your Torrington District Engineer.

END-GUIDED ROLLERS—sturdy retainer guides rollers at ends—at roller pitch circle, reducing stress on retainer, assuring effective guidance and minimum internal friction.



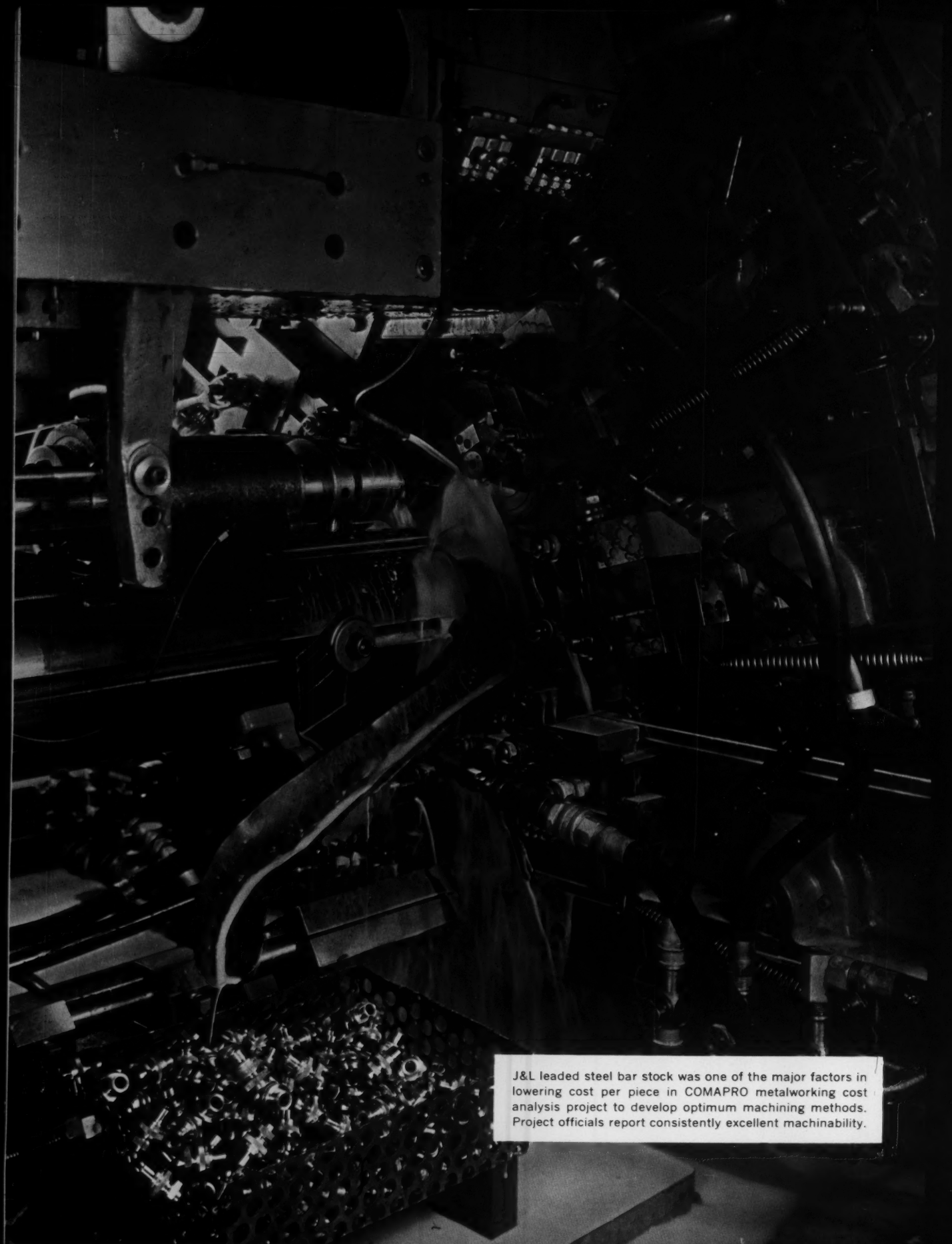
UNIFORM LOADING—Torrington controlled contour rollers eliminate stress concentration at roller ends. End-stress pattern of unrelieved cylindrical rollers is shown in black outline. Area in gray shows uniform loading over entire contact length of Torrington rollers.



AMPLE LUBRICANT STORAGE AREA is provided by the retainer design, which also allows unrestricted flow of lubricant within the bearing.

progress through precision **TORRINGTON BEARINGS**

THE TORRINGTON COMPANY Torrington, Conn. • South Bend 21, Indiana



J&L leaded steel bar stock was one of the major factors in lowering cost per piece in COMAPRO metalworking cost analysis project to develop optimum machining methods. Project officials report consistently excellent machinability.

Final COMAPRO tests prove . . .

J&L leaded steel bars are a key factor in cutting production time 30%

Excellent machinability of J&L Type A leaded cold finished bars has been proved by the widely recognized cooperative machining program conducted at Cone Automatic Machine Company, Inc., Windsor, Vt.

COMAPRO's final report covered a period of many months of tests on the machining of spark plug shells under scientific laboratory-controlled conditions.

It highlights these important facts:

1. Production time per machined unit was cut from 6.5 to 4.41 seconds—a reduction of approximately 30%.
2. The tools of the automatic bar machine demand a degree of uniform machinability in the bar stock which J&L Type A leaded steel consistently provided.
3. The free machining quality of J&L leaded steel reduced tool changes.

These results are typical of the benefits many companies have been getting with J&L free-machining steels. In actual production runs, the use of J&L's Type A leaded steel has increased overall output rates 22%, reduced tool costs 50%, and has required less power than making similar parts of conventional steel.

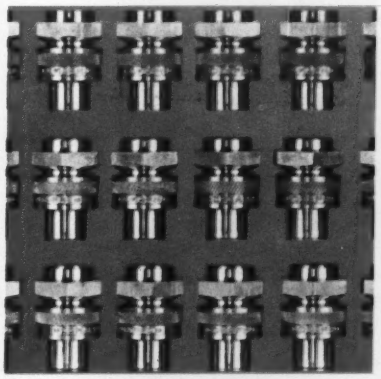
This Steelmark identifies products made of steel. Place this mark on your products. And look for it when you buy.

Steel

Jones & Laughlin Steel Corporation

PITTSBURGH, PENNSYLVANIA

Where cold rolled steels originated in 1859



Spark plug shells were selected as typical machined parts for COMAPRO tests. Note superior finish of completed units produced from J&L $1\frac{3}{16}$" leaded hexagon bar stock.

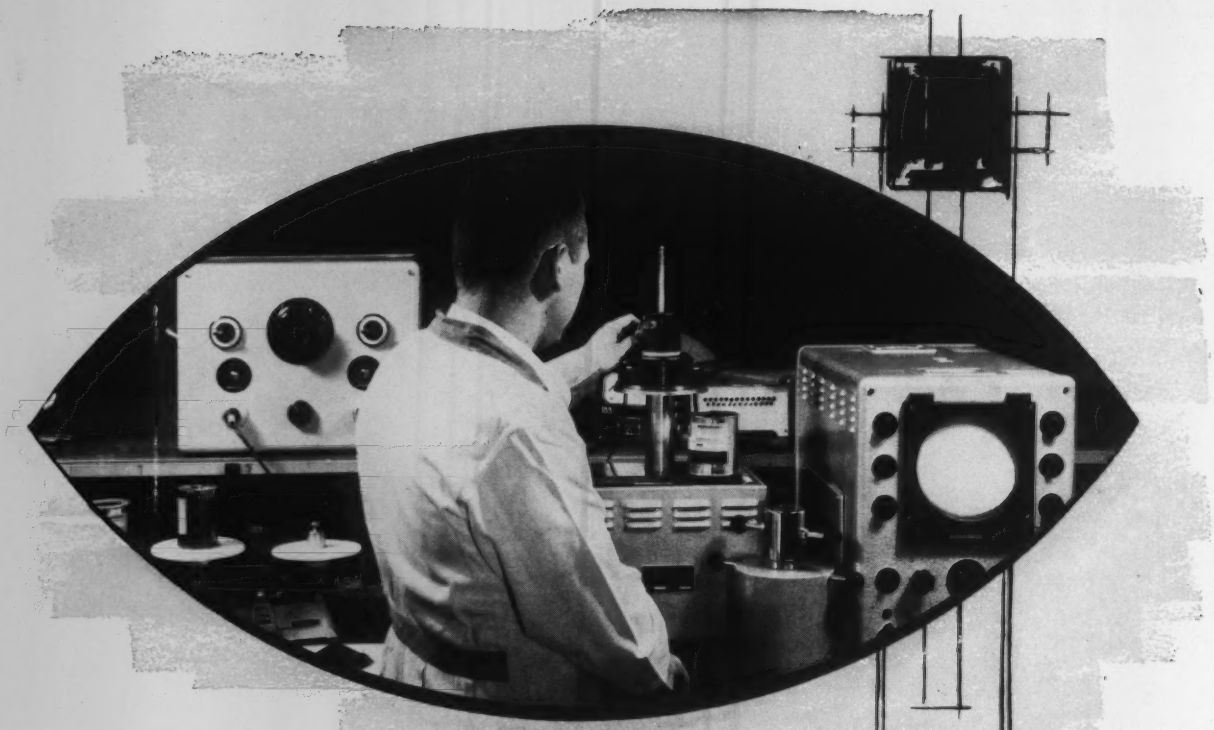
COMAPRO tests were run on this six-spindle Cone automatic bar machine which permits continuous end-to-end feed of bars from the reel into the machine.

New two-unit feed mechanism developed by COMAPRO provides quieter operation, longer tool life, stock savings, closer tolerances and other important advantages.

J&L STEEL

Six machining steps are required to produce the spark plug shell. Machining cycle time was cut 30%, due in large part to the fine machinability of J&L's leaded steel.

COMAPRO emphasizes well organized tool control; makes use of modern pre-set, quick-change type of holders, with gauges. Result: time for tool changes is greatly reduced.



To assure you of consistent quality in test materials...

At Magnaflux, constant testing, improving and creating of new powders, pastes and penetrants for nondestructive testing is a full-time job for 12 specialists and their assistants.

They use precision equipment such as you see above—plus electronic counters, digital computers, photometric instruments and other testing devices as accurate as you are likely to see in any advanced research laboratory.

Why such extreme care and why is it important to you?

There is a lot more to making consistent Magnaflux, Magnaglo and Zyglo test materials than giving them a label and a number. There are numerous critical variables that must be controlled. There are many different testing materials, powders, pastes, penetrants and developers. Each is engineered to give you precisely the test results you need. So, depending upon the material and its use, we measure and test for such specifics as:

Size and magnetic properties of particles
Color contrast or fluorescent brilliance
Specific sensitivity for particular needs
Ability to maintain brilliance and composition material
Viscosity, evaporation and contamination tolerance
Washability, flash-point and many others

During our manufacture there are continuous performance tests of *our own test materials,* run on actual defects in test parts. New or improved test materials are evaluated in our Laboratories — then tested over and over again in the field before we release them to you. Our Research Division reformulates and improves existing test materials even while it creates new ones.

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Did you know . . . there are:

13 *different*
MAGNAFLUX and MAGNAGLO materials

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ZYGLO materials

Each gives continued consistent performance. All formulated, developed and tested under continuous controls for specific performance requirements.

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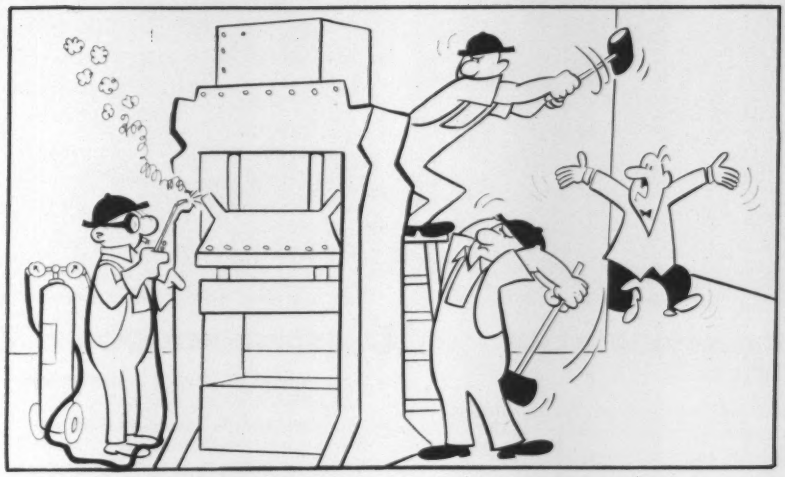


You Arbitrate It!

BREAK IT UP!

From the files of
The American Arbitration Association

■ Toward the end of 1959, management of a metal-stamping company decided to get rid of some old presses, and asked a local scrap dealer what they were worth as junk. After examining the equipment, the used-metal firm offered $26 per ton "as is and where is."

The offer was accepted and the scrap dealer sent in a few of his men with hammers and torches to break up the machines. The metal weighed in at about 4½ tons, and a check for $115 was paid to the stamping company.

"You Arbitrate It!" appears in the second issue of The IRON AGE each month. Look for it in the May 12 issue.

At this the union filed a grievance. "Breaking up those machines was work that belonged to our millwrights," the shop steward said. "It took three men a full day to do the job, so you owe the maintenance men a total of $75."

Little Gained — "We only got $115 for the metal," the personnel manager said. "If we paid $75 to our maintenance crew, we would be giving the junk away for practically nothing." Furthermore, he reminded the grievance committee that despite union efforts in that direction, there was nothing in the collective-bargaining agreement to bar sub-contracting.

Eventually, the case went to an arbitrator selected from the panels of the American Arbitration Association. How would you rule?

The Arbitrator Ruled:

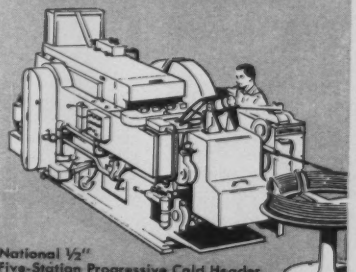
The arbitrator said that the monetary aspect of the case was not decisive. Presumably, if the company had not sold the machines "as is and where is"—in short, if company employees had dismantled them — the metal would have brought a better price. The grievance of the union was denied, however, primarily because the history of bargaining had shown unsuccessful attempts by the union to write a provision into the contract barring the company from sub-contracting work out of the unit. Under the circumstances, the arbitrator said, the company retained the right to permit outsiders to do the junking, particularly as there were sound business reasons for the action.

CAUTION: The award in this case is not necessarily an indication of how arbitrators might rule in apparently similar disputes. Each case is decided on the basis of the particular history, contract, testimony and other facts involved. Some of these essential details may have been omitted in condensing the original arbitration for brief presentation.

These important parts are cold-formed from coiled wire, start to finish in compact, efficient National Cold Headers.

The top three are formed with no scrap loss, ready to use! All six achieve remarkable savings over past methods.

If you make odd-shaped parts, may we help you evaluate them for cold-forming from wire? Better yet, come to Tiffin, witness our demonstrations and let's discuss your work.



National ½" Five-Station Progressive Cold Header

NATIONAL MACHINERY CO.
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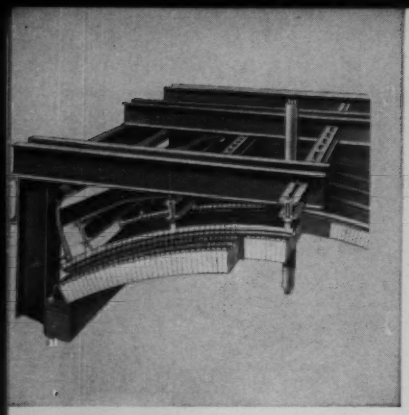
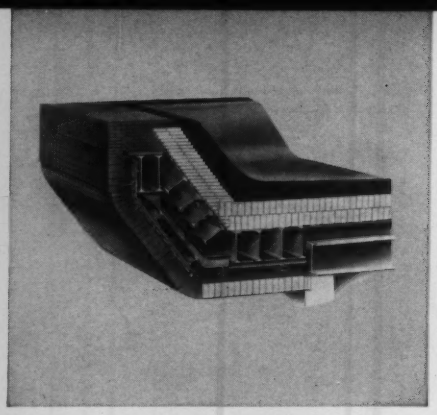
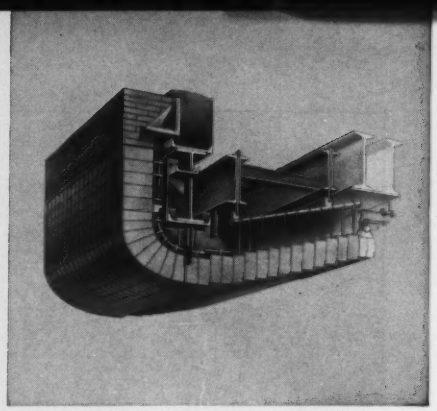






① HELD-UP, HELD-DOWN ROOF

- No roof centers to install.
- Easily hot-patched—Brick layers do entire job. No welding, no cutting.
- Pipe-supported—No special supporting members required.
- Inexpensive hangers—Simple, one-piece wire.
- Standard wedge brick—Wider bearing surfaces. More stability.

② INTERCHANGEABLE SUSPENDED CHILL WALL

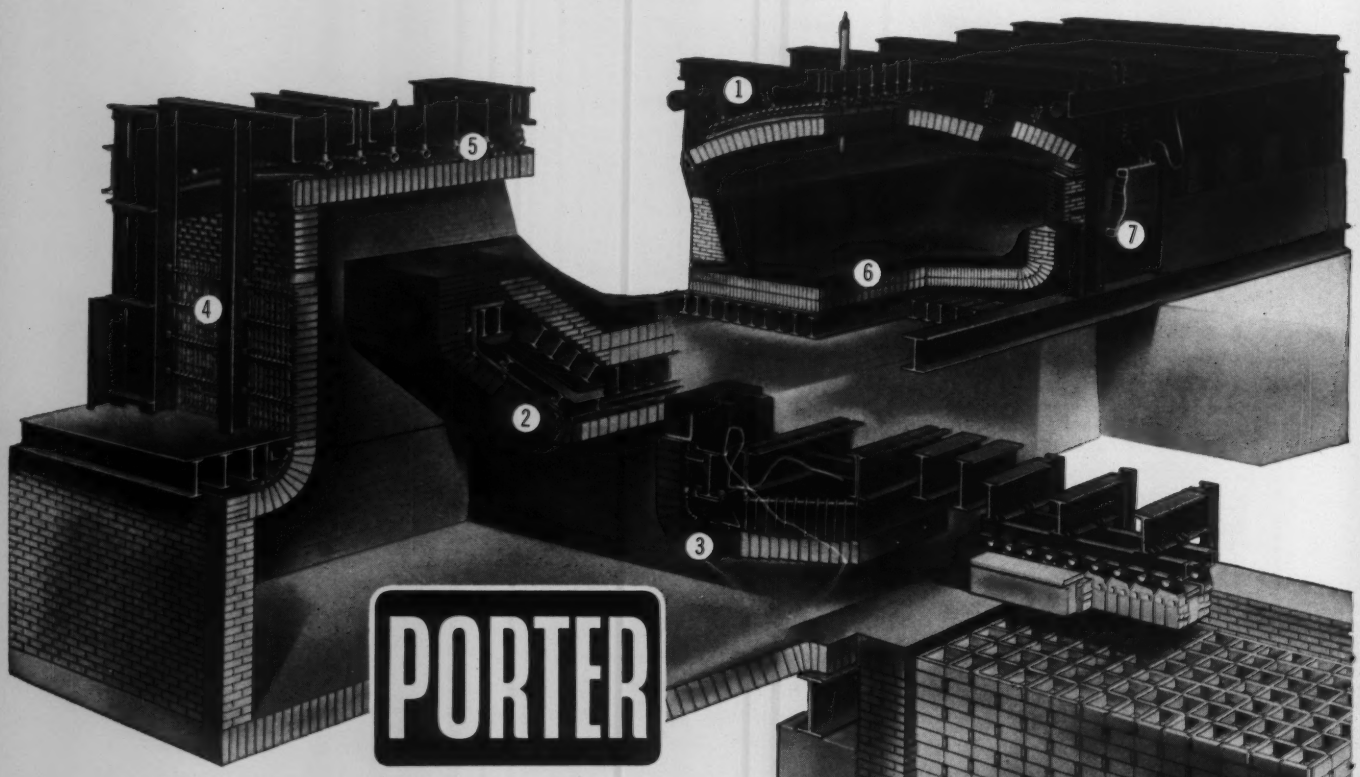
- Low cost, simple installation—Adaptable supporting structure.
- Greater expansion flexibility—Tile engaged on bed joints.
- Safe load distribution—Self-supporting castings.
- Tightly sealed joints—Tongue-and-groove clay tile.

Brick recommended: Either MC-70 Cladex or interchange with Peerlac, 60% alumina.

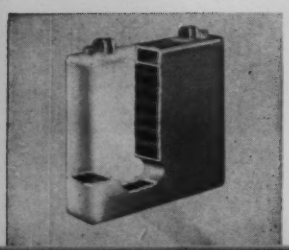
③ INTERCHANGEABLE FAN TAIL

- Pipe-supported—Easily replaced with standard mill supply stock.
- Low-cost, simple installation—Adaptable supporting structure.
- Greatest strength—Fabricated steel nose supports.
- Higher heat resistance—Alloy hangers.
- Tightly sealed joints—Tongue-and-groove clay tile.

Brick recommended: Either MC-70 Cladex or interchange with Peerlac, 60% alumina.



PORTER

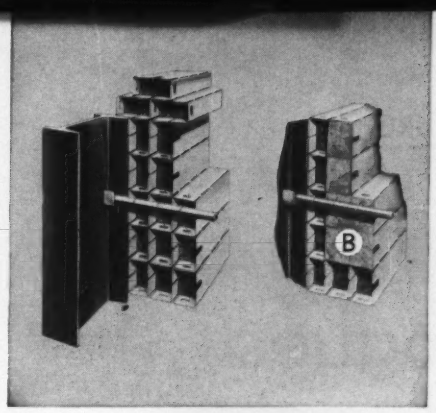


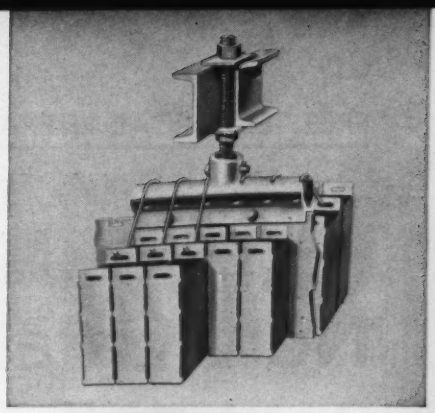
⑦ WATER COOLED OPEN HEARTH DOOR

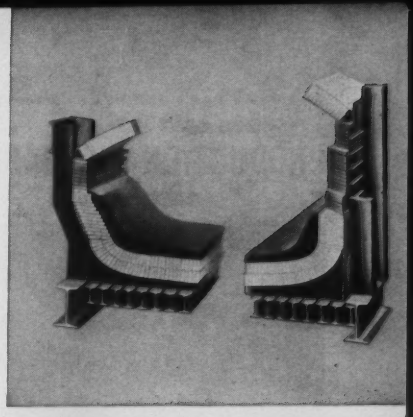
- Long life—Easily installed, easily replaced.

Recommended: Porter Plastikrom for door lining.

* Patents applied for
† T.M. applied for







4 ENDWALL CONSTRUCTION

- Air-cooled tabs (4 sides of brick)—More heat conduction for more efficient cooling.
- Refractory reinforcement for hot spots—Extended casings* permit adding refractory material on cold face (B) as hot face wears.
- Cladding with Porter Cladex†—Dimpled construction of casings provide mechanical spacing for expansion.
- Basic strength—Porter construction eliminates need for tie plates.
- Ties and pipe easily reclaimed.
- Simple one-piece hangers—Wall can be dismantled without cutting or burning.

Brick recommended: MC-70 Cladex or other specified chrome and magnesite compositions.

5 AIR CLEANED, AIR COOLED*, TAB SUPPORTED ROOF BRICK

- Built-in air cleaning—Covers entire roof. No hand blowing.
- Controlled cooling over any area—for controlled wear.
- Tab support—Simple, inexpensive.
- Air-cooled tabs—More heat conduction for more efficient cooling.
- Positive support—Tie plate anchored to pipe.
- Inexpensive hangers—Simple, one-piece wire.
- Notched tie plates—Slip into place. Easily installed or replaced.

Roof brick recommended: CM-40R Cladex or other specified chrome and magnesite compositions.

6 HEARTH CONSTRUCTION

- Monolithic subhearth—Formed by Subhearth Kromform. Easy to install. Perfect conformation.

Brick recommended for inverted arch bottom: Porter M-90B, or other specified chrome and magnesite compositions.

Ramming mix recommended for working bottom: Porter Magnaram 95 for highest MgO content. Or Magnaram 85.

Brick recommended for back wall: MC-70 Cladex. Also other burned and unburned chrome and magnesite compositions.

Brick recommended for front wall: MC-70 Cladex in standard and special jamb brick. Also available burned or unburned chrome and magnesite compositions.

Announcing the Porter All-Basic Furnace—industry's most advanced all-basic open hearth roof

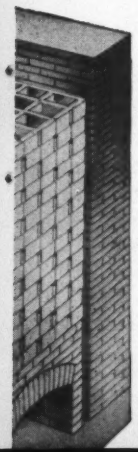
both suspension and refractories by Porter

It's here in detail . . . the Porter All-Basic Open Hearth!

A new concept in roof and endwall suspension employing the present fundamental construction now in use. Both incorporate a new, *all-metal cladding* method to provide proper expansion allowance throughout the entire system.

The suspension system and the basic refractory materials are designed to work together . . . no guesswork regarding either. There is no division of responsibility; Porter is your complete source.

For more information write *Refractories Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*



REFRACTORIES DIVISION PORTER **H.K.PORTER COMPANY, INC.**

PORTER SERVES INDUSTRY: with Rubber and Friction Products—THERMOID DIVISION; Electrical Equipment—DELTA-STAR ELECTRIC DIVISION, NATIONAL ELECTRIC DIVISION; PEERLESS ELECTRIC DIVISION; Specialty Alloys—RIVERSIDE-ALLOY METAL DIVISION; Refractories—REFRACTORIES DIVISION; Electric Furnace Steel—CONNORS STEEL DIVISION, VULCAN-KIDD STEEL DIVISION; Fabricated Products—DISSTON DIVISION, FORGE AND FITTINGS DIVISION, LESCHEN WIRE ROPE DIVISION, MOULDINGS DIVISION, H. K. PORTER COMPANY de MEXICO- S. A.; and in Canada, Refractories, "Disston" Tools, "Federal" Wires and Cables, "Nepcoduct" Systems—H. K. PORTER COMPANY (CANADA) LTD.

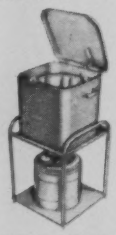
SMART
PRODUCTION-INCREASING
IDEA!

Save a Machinist's Time
get more production with
PROTECTOSEAL
wash and dip tank stations

When you can keep skilled machinists where they belong—at their machines, doing productive work—you're saving their time and increasing *your* production. Place a Protectoseal Safety Wash or Dip Tank at or near your machines and enable machine operators to wash or clean parts for further work or for inspection *at the job*, and eliminate the unnecessary trips to a centrally located cleaning station.

Protectoseal Wash and Dip Tanks are designed for safe handling of flammable cleaning solutions. A renewable fusible link automatically drops the cover to snuff out fire. All Protectoseal Tanks are Factory Mutual approved, and are available in many types and sizes.

PROTECTOSEAL WASH AND DIP TANK STATION
Complete, self-contained stations, available in various sizes and combinations to meet individual requirements include: Work High Stands, Wash and Dip Tanks in various capacities, Self-Draining Parts Baskets, and 5 Gallon Safety Storage Containers for replenishing tank solvent supply.



OTHER TIME-SAVING PROTECTOSEAL PRODUCTS

MACHINE BENCH CAN
For attachment to machine or bench. Depressing dasher (fire screen) immerses parts in solvent. Spring action returns dasher to original position, allowing parts to drain. 10"x7"x8" deep; cap. 2 gallons.

BENCH PLUNGER CAN
Fire-protective dasher depressed by hand, delivers measured amount of cleaning solvent to rag, swab, brush. Reduces evaporation losses, minimizes hazard of explosive and toxic vapors. 5 sizes.

AIR-MATIC PARTS WASHER
Air operated small parts washer. Parts in basket are moved through cleaning solvent. Requires no operator attention during washing. 15"x15" square, 25½" high. Capacity, 6 gal.; 30 lb. basket load.

Write for Protectoseal Catalog of fire-safe products for handling, dispensing, and use of flammable solvents in production operations.

THE PROTECTOSEAL COMPANY
1926 S. Western Ave.-Chicago 8, Illinois

New Catalogues And Bulletins

Money-saving products and services are described in the literature briefed here. For your copy just circle the number on the free postcard, p. 175.

High-Head Pumps

A four-page, two-color bulletin describes a new series of two-stage, high-head leak-proof "canned" pumps. The pumps are designed for pumping at heads up to 600 ft, and handling fluids at temperatures to 850°F, and at high system pressures to 3500 psi. (Chempump Div., Fostoria Corp.)

For free copy circle No. 1 on postcard, p. 175

Building Wire

A polyvinyl-chlorine-compound building wire and its applications in wiring are discussed at length in a product bulletin. The wire is used for hazardous industrial locations. The illustrated bulletin describes physical properties and electrical characteristics of the wire and the many industry specifications it meets. Included is information on AWG size, insulation thickness, outside diameter, and weight. (Rome Cable Div. of Alcoa)

For free copy circle No. 2 on postcard, p. 175

Plastic-Faced Patterns

Calcerite, a special melamine resin, can be economically cast in large volumes as a backup for strong, non-porous, epoxy surfaces. Patterns prepared in this manner have found considerable acceptance by aircraft and missile makers and in various foundry and metalworking shops throughout the country. Details and development of such patterns and tooling dies are illustrated in a short release sheet. (Furane Plastics Inc.)

For free copy circle No. 3 on postcard, p. 175

Motor Coils

Information on replacement coils, manufactured to original equipment size and electrical design, appears in an informative bulletin. The four-page bulletin describes how problems of overheating and improper speed can be avoided. (General Electric Co.)

For free copy circle No. 4 on postcard, p. 175

Diffusion Furnaces

Gaseous and solid diffusion furnaces are illustrated in a four-page bulletin. Specifications and general information are included. The technical specifications, in chart form, cover the single-zone, dual-zone and multi-zone types of furnaces. (Lindberg Engineering Co.)

For free copy circle No. 5 on postcard, p. 175

Heat Exchangers

Full-page illustrations, cutaways, diagrams, and design data appear in an informative manual on impervious graphite heat exchangers. Principles of operation are explained in a lucid manner. At the back of the manual there's a full-page, perforated-inquiry-data sheet which should prove valuable to companies seeking additional information and/or solutions to current problems. (The Carbone Corp.)

For free copy circle No. 6 on postcard, p. 175

UNITED® 46" x 90" SLABBING MILL

UNITED ENGINEERING AND FOUNDRY COMPANY

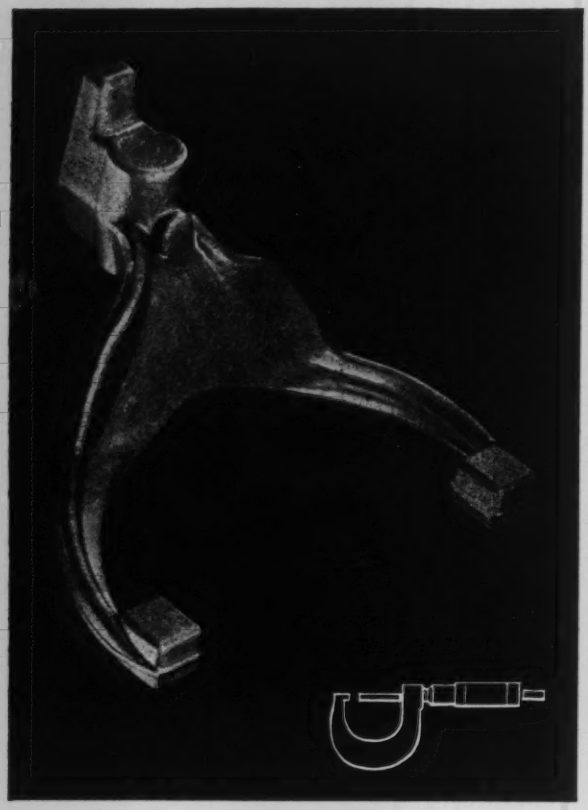
PITTSBURGH, PENNSYLVANIA

Plants at Pittsburgh, Vandergrift, Youngstown, Canton, Wilmington

SUBSIDIARIES: Adamson United Company, Akron, Ohio; Stedman Foundry and Machine Co., Inc., Aurora, Indiana

Designers and Builders of Ferrous and Nonferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

RITCO FORGINGS



...their accuracy alone merits your design consideration!

Close-tolerance accuracy which eliminates the need for costly machining is, in itself, a sound reason for specifying Ritco Forgings. A flawlessly smooth surface which helps speed product assembly is still another. Combine these advantages with a forged-in toughness which assures maximum impact resistance and fatigue strength at points of greatest shock and stress and it's easy to see why more and more design engineers write Ritco into their plans. *All* things considered, it will pay you to learn more about Ritco "Bright Finish" Forgings now. Send us your blueprints for estimates at no obligation.

Ritco also offers complete machining facilities and makes Special Fasteners and Upsets of ferrous and non-ferrous metals. What are your requirements?

RHODE ISLAND TOOL COMPANY
Member Drop Forging Association
144 WEST RIVER STREET • PROVIDENCE 1, R. I.

HOW LONG SINCE YOU CHECKED ON PERFORATIONS?

No matter what material your product demands Mundt can supply the exact perforation you need. Steel, brass, copper, monel, bronze, aluminum, zinc, tinplate, lead, stainless steel, coated metals, bonded materials, plastics, and paper are punched as required for every functional and ornamental need.

You can count on Mundt's guarantee that sheets are perfectly flat, straight, parallel on the sides, and free from buckle or camber.

Our modern tool and machine shop is constantly making new dies to add to the tremendous variety of screens available. If you have a special problem we'll gladly supply design and metallurgical assistance.

No job is too small for our careful, personal attention . . . or too large for prompt delivery. Mundt's 90 years' experience is at your disposal.

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CHARLES MUNDT & SONS
53 FAIRMOUNT AVENUE, JERSEY CITY 4, N. J.

PERFORATING SPECIALISTS FOR ALL TYPES OF MATERIALS

COLUMBIA TOOL STEELS

Confidentially, people who *make money* with non-deforming steel dies use EXL-DIE (Type O1) oil hardening steel

Product of Skilled American Workmen

COLUMBIA TOOL STEEL COMPANY
400 Lincoln Highway
Chicago Heights, Illinois

TOOL COLUMBIA STEELS

FREE LITERATURE

Continued

These publications describe money-saving equipment and services . . . they are free with no obligation . . . just circle the number and mail the postcard.

Metal Impact Tester

Conforming to ASTM Specification E-23, a motorized impact tester can perform izod, charpy or tension-impact tests. Hammer heads are quickly and easily interchangeable. Four energy scales are provided. Scale values are: 0-220 ft-lb by 2 ft-lb divisions; 0-100 ft-lb by 2 ft-lb; 0-88 ft-lb by 0.5 ft-lb; and 0-40 ft-lb by 0.5 ft-lb. (Testing Machines Inc.)

For free copy circle No. 7 on postcard

Aluminum-Alloy Guide

A 24-page booklet provides a guide to the selection of aluminum alloys for virtually any product that can be made of the light, corrosion-resistant metal. The booklet describes the physical properties, fabrication characteristics and economic advantages of a wide variety of aluminum-sheet, plate, rod, bar, extrusion, and casting alloys. Various tempers, finishes and patterns are discussed. (Metals Div., Olin Mathieson Chemical Corp.)

For free copy circle No. 8 on postcard

Structural Adhesives

A condensed catalog describes a complete line of adhesives, laminating materials, putties and sandwich cores. Effective application temperature ranges appear in chart form. (Narmco Resins & Coatings Co.)

For free copy circle No. 9 on postcard

Roller Chains

Stock sizes of roller chains and sprockets, available for immediate delivery in every major industrial area, are listed in a 44-page booklet. An 18-page section of the booklet lists stock sizes of standard roller chains—single, double, triple and quadruple strand — together with heavy-series roller chains, corrosion-resistant stainless steel and bronze roller chains. Also covered in the same section are double-pitch roller chains, various types of flat-top conveyor chains and leaf chains. A 20-page section describes sprockets. These sprockets include: finished - bore, taper - lock, mandrel-bore and shear-pin types. (Link-Belt Co.)

For free copy circle No. 10 on postcard

Hacksaw Blades

Handy tables of manufacturers' recommendations for speed and feed of power saws appear in a metal-cutting guide. Also discussed are types of saws and teeth to use for various metals; useful tips on the use of hand hacksaws; and illustrations and specifications for a complete line of metal-cutting blades. (Akins Saw Div., Borg-Warner Corp.)

For free copy circle No. 11 on postcard

Grinder

A technical bulletin covers a new deburring and chamfering grinder for spur, helical, and bevel gears. At the same time, the machine deburrs and chamfers the entire contour of both ends of the teeth of gears. (Michigan Tool Co.)

For free copy circle No. 12 on postcard

Recording Supplies

Chart papers, writing styli and other supplies for direct-writing equipment are described in a short folder. The folder contains samples of chart papers with typical recording traces in three basic techniques —ink, electric and thermal. Pens and styli for each mode of recording are also illustrated. (Brush Instruments Div., Clevite Corp.)

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Valves

Valves for fluid flow and condition control are covered in an eight-page booklet. Introductory material details such design and selection

Postcard valid 8 weeks only. After that use own letterhead fully describing item wanted. **4/14/60**

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FREE LITERATURE

factors as function, application, and method of actuation. Additional information includes engineering data, characteristics, range specifications, and illustrations of various types of valves. (United Aircraft Products, Inc.)

For free copy circle No. 14 on postcard

Welding Electrodes

A comprehensive catalog covers the manufacturer's complete line of welding electrodes, gas-welding rod, non-consumable electrodes, submerged-arcwelding flux and automatic-welding wire. In addition to a handy application diagram, the following information is given for each electrode: description, color code, outstanding features, mechanical properties, typical chemical analysis of weld metal, approvals, conformances, size, current range, packaging, procedure and typical applications. (Hobart Brothers Co.)

For free copy circle No. 15 on postcard

Control Systems

Digital recording and control systems are featured in an illustrated bulletin. Applications include: industrial recording and control systems for strip and plate rolling operations; wind-tunnel data recording; aircraft and missile testing; high-speed acquisition of radio-telescope data; and nuclear uses. (Datex Corp.)

For free copy circle No. 16 on postcard

Isolate Vibrations

Vibration and noise isolation, for relatively light loads, is outlined in a short data sheet. Applications and performance for the vibration insulators are discussed. (Barry Controls Inc.)

For free copy circle No. 17 on postcard

Portable Nibbler

Specifications on a heavy-duty portable nibbler appear on a short data sheet. The nibbler is accurate and versatile. It cuts ¼-in. steel plate and 5/16-in. aluminum where it's necessary to retain an original contour. This makes the unit ideal for template making. (Fenway Machine Co., Inc.)

For free copy circle No. 18 on postcard

Flame Cutting

How to lower your production and machining costs, through precision flame cutting, is described in a six-page brochure. Precision flame cutting can be used to produce gears and other complex parts—without machining. (Jessop Steel Co.)

For free copy circle No. 19 on postcard

Thread Cutter

A data sheet presents information on a portable thread cutter. The sheet lists special features, advantages, price, and uses of the thread miller. It proves its versatility by its ability to fit 9- to 20-in. screw-cutting engine lathes. (Fen-Thread Machine Co., Inc.)

For free copy circle No. 20 on postcard

Thermostat Elements

Subject of a short data sheet is stacking of thermostat metal elements, in spaces that prohibit the use of a single element with sufficient material volume. Rules for determining thermal deflection, mechanical deflection and force of each type of assembly—as compared to the properties of the single elements that make up the assembly—are presented. (Metals & Controls Div., Texas Instruments Inc.)

For free copy circle No. 21 on postcard

Pressure Transducer

Specifications and design features for a flush-mounted, strain-gage transducer appear in a short bulletin. The transducer handles pressure measurements in extreme environmental conditions. It has provisions for adjustment of bridge balance, temperature compensation and sensitivity—external to the sealed sensing element. The transducer operates at temperatures ranging from —320° to +300°F. Maximum gage- and absolute-pressure measurement is 5000 psi. (Consolidated Electrodynamics Corp.)

For free copy circle No. 22 on postcard

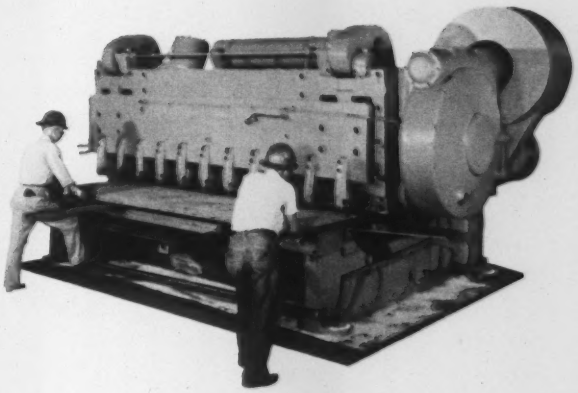
One steel "SANDWICH" coming up

A typical example of **Ingersoll** versatility in fine quality specialty steels

For a wide variety of product applications, Ingersoll produces specialty steels made up of composite layers. These include Ingersoll's famous IngAclad stainless-clad steel, soft center steel, and 2-ply knife steel—all widely used in industry.

To make such sandwich-type steels properly calls for special experience and skill, special care and handling from melting to rolling to shearing and blanking. But that's typical of *all* the specialty steels Ingersoll makes—where fine quality is the standard at every step of the way to make sure the steel you get meets your exact specifications.

And that's the best reason of all why Ingersoll Steel is such a good name to know, a good place to go for the specialty steels you need. Try us—we think you'll agree.



INGERSOLL STEEL B-W BORG-WARNER

SAW STEELS • HIGH SPEED POWER AND HAND HACK SAW STEELS • KNIFE STEELS • STAINLESS STEELS • HEAT RESISTING STEELS • INGACLAD STAINLESS-CLAD STEEL SHEETS • CROSS ROLLED STEELS • CARBON ELECTRIC STEELS FOR AUTOMOTIVE, TRACTOR, AND OFF-HIGHWAY EQUIPMENT CLUTCH DISCS AND CLUTCH STEERING RINGS • ALLOY STEELS • ULTRA HIGH STRENGTH STEELS • SOFT CENTER AND OTHER AGRICULTURAL STEELS • FORGING QUALITY ELECTRIC FURNACE INGOTS TO 23,000 POUNDS

Ingersoll STEEL DIVISION

Borg-Warner Corporation • NEW CASTLE, INDIANA

Don't spoil it- KROIL it!

Don't ruin a valuable piece of equipment merely because some part is rusted tight. Apply *KROIL*, the amazing new chemical lubricant that creeps into millionth inch spaces (proved by laboratory tests), **dissolves rust, supplies necessary lubrication and . . .**

Loosens Frozen Parts

18,000 of America's leading plants can't be wrong. They have used KROIL for ten years and depend on it to save expensive labor and valuable parts. They say: "Kroil loosened bushings after a 12-ton press had failed" . . . "on repairing heat treat trolleys formerly destroyed every nut. Now Kroil saves them all, and time, too."

You too can get these results. Try KROIL on money-back basis.

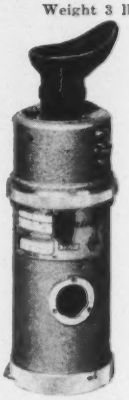
Gallon, $4.35; with Kroiler squirt gun, $5.25, f. o. b. factory.

Ask for GENIUS AT WORK—a free publication full of ideas for maintenance men.

KANO LABS. 1091 Thompson Lane Nashville 11, Tenn.

"OPTIX" The Universal Optical PYROMETER

Weight 3 lbs.



This precision made partial Radiation Optical Pyrometer is time-proven by over 30 years of use in the iron and steel industry throughout the world. Unique design combines all mechanical and optical parts within a handy telescope type housing. Special Model for Molten Iron and Steel.

Write for literature on the above, and the following:

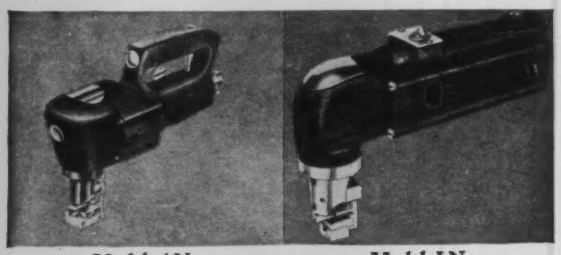
- *Color Pyrometer BIOPTIX* for direct reading of *true* and *black* temperature.
- *Portable Total Radiation Pyrometer "PYRO"* for annealing and hardening furnaces and baths.
- *Surface Contact Pyrometers* with a variety of tracers.

Single measuring range 1400-2500° F, or 1800-3400° F. **$210.00**

Double measuring range 1400-2000° F, and 1800-3400° F. **$268.00**

With supplementary range 3400-5400° F. **$290.00**

EPIC INC. 150 Nassau St. New York 38, N. Y. Digby 9-2470 D.S.



Model AN Model LN

CUT YOUR METAL CUTTING COSTS 75%, USE THE FENWAY POWERFUL, PORTABLE NIBBLER WITH THE BIG PUNCH

INCREASE PRODUCTION! Save Metal Waste! Eliminate Finishing Operations!

Portable FENWAY NIBBLERS (air powered or electric) are easily moved to the cutting job (wt: 8-13 pounds according to model)—You can cut up to five feet per minute without distortion. Your metal waste is cut to a minimum—No grinding or buffing to finish off. Fenway Nibblers cut up to 8 gauge mild steel or 10 gauge stainless. Easily converted to cut corrugated sheeting, small diameter ducts, formed sheet metal pipe, tough pitch or asbestos coated corrugated steel—consistent smooth edges, no curling, no chipping, no flaking. Investigate this powerful, durable time saving nibbler. Easy to handle, minimum maintenance, unconditionally guaranteed. ¼" nibbler now available.

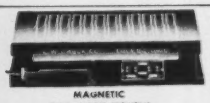
WRITE TODAY FOR FREE DEMONSTRATION

FENWAY MACHINE CO., INC.,
3107 N. Broad St., Phila. 32, Pa.

BOOTH 1619 ASTE SHOW

LW CHUCKS

Real Values in Precision and Accuracy . . .



MAGNETIC GRIP WORK TIGHTLY for Wet or Dry Grinding. Guaranteed waterproof. Connections for either 110 or 220v. D.C.

WORKING SURFACE
5⅛" x 13" **$80.00**
6½" x 18" **$100.00**
8" x 24" **$213.50**
10¾" x 37" **$375.00**

DEMAGNETIZERS
Instantly demagnetize tools or production parts. No moving parts. 110 v., 60 cy. A.C.

PLATE TYPE
MODEL B-2
7¼" x 12½" x 6⅛"
Ship. wt. 55 lbs. $78.00
MODEL J-1
7¼" x 7¼" x 6⅛"
Ship. wt. 35 lbs. $54.00

ROUND TYPE
3¾" openings
$27.50

RECTIFIERS A.C. input 110 volts; D.C. output 110 volts. P-1 for 5⅛" x 13" chuck 0.8 amps. $57.50
P-2 for 6½" x 18" chuck 1.0 amps. $68.75
P-3 for 8" x 24" and 10¾" x 37" chuck 3.0 amps. $87.50

DEMAGNETIZING SWITCHES For 5⅛" x 13" and 6½" x 18" sizes. $15.00
Field discharge type for 8" x 24" and 10¾" x 37". $27.00

LATHE
Heavily ribbed, semi-steel cast body. Ground face and outside diameter. Solid steel hardened and ground jaws. T Hand Wrench included.

4-JAW INDEPENDENT
6" 8" 10" 12" 14"
Reversible jaws, wide gripping surface. Tough, oversize, hardened alloy steel screws with accurately cut square threads. Hardened alloy steel anchor bearings.

3-JAW UNIVERSAL
Guaranteed to run true for lathe or screw machine work. 6", 8" and 10" sizes come complete with two sets of accurately fitted jaws, male and female. 5" size has body threaded 1⅛" x 8". (or can be furnished for use with adaptor plates) and comes with one set of 3 reversible jaws. One high grade hardened steel pinion used on 5", 6", and 8". 3 on 10" size. Special alloy scroll.

SEE YOUR DEALER OR ORDER DIRECT, GIVING DEALER'S NAME

LW CHUCK COMPANY
96 So. St. Clair Street
Toledo 4, Ohio

FREE LITERATURE

Protective Coatings

A one-coat, protective-coating system can be applied in thicknesses up to 20 mils. It's safe and easy to use. Its flash point exceeds 100°F. The protective coating is featured in a short data sheet which covers rust-inhibitive properties. (Prufcoat Laboratories, Inc.)

For free copy circle No. 23 on postcard, p. 175

Pallet Truck

Operating details for a 2000-lb capacity, lightweight hydraulic pallet truck appear in a four-page brochure. The new truck has several good operating features. These include: 360° operation of the tow handle; high location of the handle pivot for easy pulling; life-time lubrication and a high-pressure hydraulic foot-lift pump. (Lewis-Shepard Products, Inc.)

For free copy circle No. 24 on postcard, p. 175

Drive Systems

High-speed indexing components, dial feeds, transfer machines and allied equipment are featured in a 40-page bulletin. Also included are data on: the universal system of cam design; how to calculate load requirements; and how to select the proper drive. Complete load ratings, dimensions and installations data appear in table form. (Ferguson Machine Corp.)

For free copy circle No. 25 on postcard, p. 175

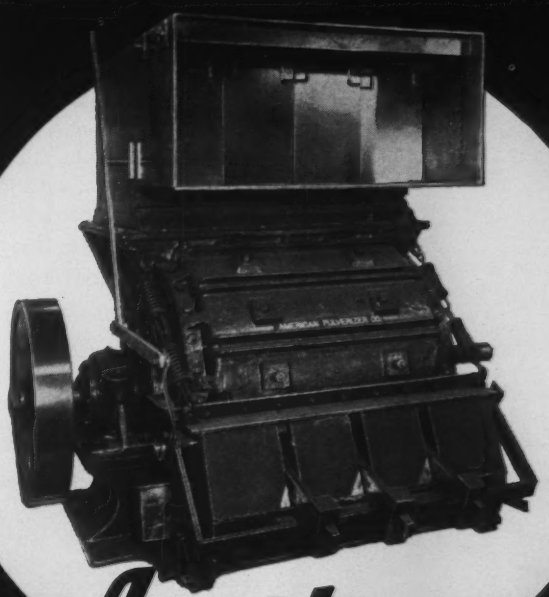
Hydraulic Accumulators

How accumulators are used in a wide variety of hydraulic systems is explained in a short folder. Also included are descriptions and technical data on piston-type accumulators ranging in capacity from 10 cu in. to 10 gal. Schematic diagrams show accumulators used to prevent shock, multiply horsepower, reduce size of required pumps or to eliminate pumps. (Parker-Hannifin Corp.)

For free copy circle No. 26 on postcard, p. 175

CASH IN YOUR CHIPS

Change Metal Turnings Waste into More Profitable Shoveling CHIPS



American METAL TURNINGS CRUSHERS

No progressive, profit-conscious company—who produces 10 or more tons of metal turnings per month—can afford to ignore the profit potential of a modern chip salvage system . . . with an American Metal Turnings Crusher at the core.

American installation profits include: $4 more per ton for chips than for machine turnings; up to 50 gallons per ton in cutting oil recovery; 75% less storage; easier, faster handling.

How many profit dollars are you losing under present operations? If, for example, you're currently producing 20 tons of turnings a month . . .

THIS COULD BE YOUR PROFIT STORY FOR NEXT YEAR!

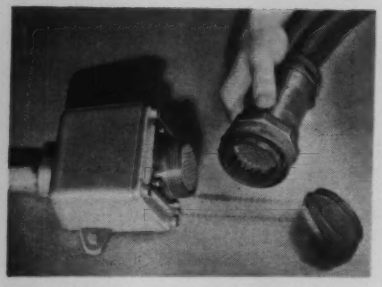
240 Tons Metal Turnings per Year (20 tons/month at $4 extra per ton)	$ 960.00
6,000 Gallons Recovered Cutting Oil at 30¢/Gal. (50 gals. per ton x 240 tons = 12,000 gals. Half of this, 6,000 gals., can be credited to use of chips instead of turnings in reclamation)	$1,800.00
Estimated Savings in Manpower, Storage, Tools, Maintenance, Freight, etc.	$ 300.00
TOTAL GROSS PROFIT	$3,060.00

American PULVERIZER COMPANY — Originators and Manufacturers of Ring Crushers and Pulverizers

WRITE for Metal Turnings Crusher Bulletin.

1439 MACKLIND AVE. • ST. LOUIS 10, MO.

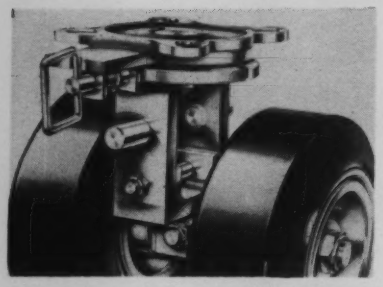
New Materials and Components



Electrical Connectors Exceed Rigid Standards

Exceeding rigid industrial and military standards, a complete line of electrical connectors provides performance under adverse environmental conditions. They are moisture-proof, shock-insulated, dust-tight and corrosion-resistant. They also have the ability to break circuits under full-rated load. All of these connectors operate in a temperature range of —80° to +225°F. They withstand an internal pressure of 300 psi. Another feature is positive polarization. Assembly can be made only one way. (Crouse-Hinds Co.)

For more data circle No. 27 on postcard, p. 175



Casters Provide Good Strength at Fast Speeds

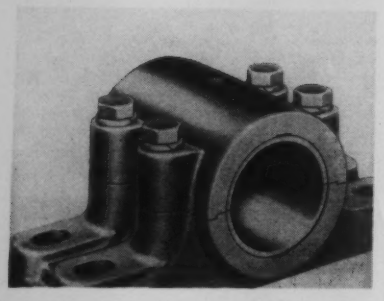
Industrial casters feature a dual-wheel, self-aligning arrangement suitable for use on heavy-duty transporting dollies. Each caster has two 10- x 4-in. press-on tires. Excellent for towing at high speeds, the casters have a load rating of 2500 lb at 10 mph. Also available are other dual-wheel models with load ratings up to 15,000 lb. All of these casters have roller bearings and a four-position lock. Other casters for industrial use include grease-sealed and dual-lock types. (Faultless Caster Corp.)

For more data circle No. 28 on postcard, p. 175

Bellows Meter Features Rapid Range Changing

Equipped with a 6-in. dial, a bellows meter suits flow and liquid-level applications that do not require recording. Typical uses include indicating steam, air, gas and water volume for industrial processes and side streams or cuts from fractionating towers. Fifteen ranges from 0-20 to 0-400 in. of water are available. Range changing takes place by substituting spring assemblies. Each meter has a stainless-steel-pointer pinion which provides proper meshing and correct indication under any conditions. (Brown Instruments Div., Minneapolis-Honeywell Regulator Co.)

For more data circle No. 29 on postcard, p. 175



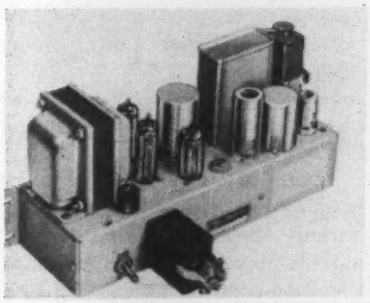
Pillow Blocks Permit Easy Liner Replacement

Pillow blocks of a new design allow bronze precision liners to be replaced quickly and easily. These units are recommended for use where shock loads, elevated temperatures or corrosive conditions are anticipated. Liner replacement takes place quickly. Only the cap of the block needs to be removed. Then the shaft is loosened—just enough to permit the lower half of the liner to slip out. A new bronze liner is then inserted and seated by tapping lightly. The cap liner can also be replaced just as easily. No screws are required. Bearing ends are precision machined. (Dodge Mfg. Co.)

For more data circle No. 30 on postcard, p. 175

Servo Amplifiers

Compact high-gain servo amplifiers, sensitive to a 3 microvolt change in input signal and with ±2 microvolt stability, are suitable for self-balancing instruments of laboratory accuracy. Each amplifier maintains its performance ratings even



where electrical interference, extreme variations in power supply, and high-external-input resistance are present. These units are used primarily for industrial-process control systems. They are easily installed and maintained. (Thermo Electric Co.)

For more data circle No. 31 on postcard, p. 175

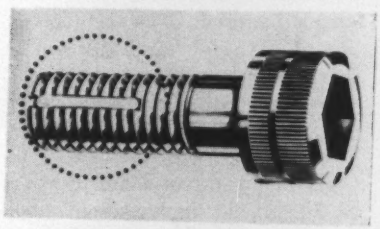
Gold-Alloy Strip

Precision rolled to tolerances down to ±0.0001 in., gold-alloy strip finds use in a wide variety of industrial components; where its unusual properties of conductivity, solderability, ductility, and chemical corrosion resistance are necessary. The material is available in strip to 4-in. maximum width, in thicknesses down to 0.0005 in. (Accurate Specialties Co., Inc.)

For more data circle No. 32 on postcard, p. 175

Socket Screws

Featuring a self-locking insert, a new line of socket screws has a re-

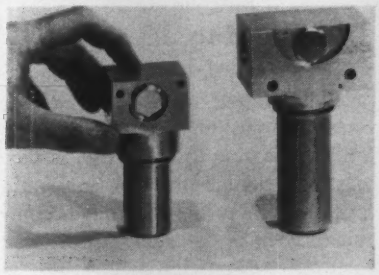


markable resistance to shock and vibration. The screws, with self-locking inserts, will solve many of the problems where vibration is a major factor; holding its grip even in unusually adverse applications where frequent adjustment is a requirement. The design of the fastener is such that the nylon-type polymer insert does not protrude, and thus passes easily through all normal-clearance holes. (Parker-Kalon)

For more data circle No. 33 on postcard, p. 175

Hydraulic Filters

Two new high-pressure, airborne hydraulic filters feature light weight and compact design. They are rated at 3.5 gpm and 10 gpm. Their filter ratings are 10 microns. Filter elements consist of pleated, resin-

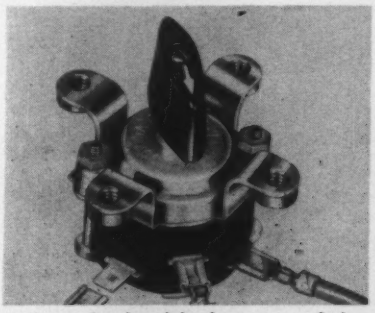


impregnated, cellulose-fiber sheets. Both assemblies have a pressure drop of 30 psig at their respective flow rates. Temperature ratings are from —65° to +275°F. (Bendix Filter Div., Bendix Aviation Corp.)

For more data circle No. 34 on postcard, p. 175

Rotary Power Switch

Permitting rapid wiring with snap-on connectors, a 10-amp switch has male quick-connect terminals. These terminals are integral with the stationary contacts,



and can be furnished on any of the side-connected switches having either make-before-break or break-before-make contacts. (Electro Switch Corp.)

For more data circle No. 35 on postcard, p. 175

"the HITCHINER way..."

cut costs two-thirds by INVESTMENT CASTING

These roller mounts, used on a precision skin-grafting machine, guide rollers which regulate the depth of the skin graft. The material used must withstand the high temperature of sterilizing and the corrosive elements of human blood.

The user of these stainless steel roller mounts once thought they could only be made by machining of stainless steel bar stock. Hitchiner's "Engineered Quotation" showed they could be investment cast, not only in the necessary alloy and without design changes, but with considerable savings.

The use of investment casting meant five times greater production without highly-skilled labor, a one-per-thousand reject rate, and a per unit cost of a third that of machined parts.

This wide freedom of choice in alloy, as well as flexibility in design may help you with your parts manufacturing problems. Try "the Hitchiner way" yourself and send us a sample or blueprint for our "engineered quotation" — no obligation.

Find out how our new ceramic shell technique can possibly benefit you. Send for our free, new revised brochure on the latest investment casting methods.

HITCHINER
MANUFACTURING COMPANY INC.
MILFORD 25, NEW HAMPSHIRE

Coast to Coast Engineering Representatives

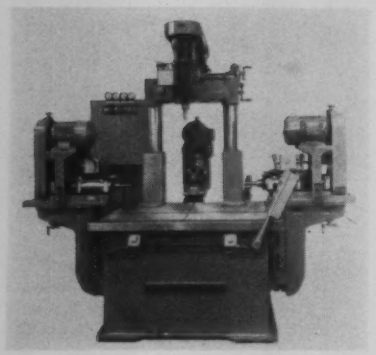
Previews Point Up Highlights Of Tool Engineers Show

Watch for these displays as you walk through the aisles of the coming ASTME Tool Show.

It's only by checking the latest in tooling methods and equipment that you can plan to meet competition.

Versatile Machine Tool

A new drilling, tapping, boring, reaming and spot-facing machine performs operations on as many as five sides of a workpiece during a single working cycle. The machine is available with any combination of one to four horizontal power units and one vertical power unit. Each power unit runs independently of the others. A cycle selector makes it possible to actuate power units on the first or second pass—or in any multiples. (Wisconsin Drill Head Co., Booth 621)



For more data circle No. 40 on postcard, p. 175

Thread Miller

Fitting any lathe, a portable thread-milling machine does not require operation by a skilled person. In 4 to 5 minutes, a person can complete the setup to cut any 60°, Acme, or square thread. One pass completes thread cutting, threading any type of material, including every kind of plastic, to beryllium, stainless steel, and titanium. Cutters range from ½ to 9 in. for internal threading, and from 1/32 to 9 in. for external threading. The unit cuts from 4 to 200 threads per in. (Fenway Machine Co., Inc., Booth 1619)

For more data circle No. 41 on postcard, p. 175

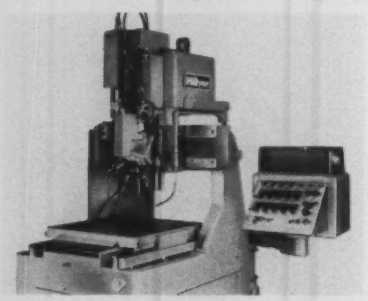
Die-Casting Machine

Featuring high-speed automatic cycling, a four-way adjustable die unit and an unusual die-cleaning and lubricating brush device, a die-casting machine provides automatic cycling. Each time-controlled, complete cycle is the same as the one before. Automatic cycling results in better thermal balance. It also precludes dimensional variations due to early or late ejection. (DCMT Sales Corp., Div. of British Industries Corp., Booth 1719)

For more data circle No. 42 on postcard, p. 175

Drilling Machines

Numerically-controlled drilling machines maintain complete control of all drilling, tapping and reaming operations. This permits a given tool to be programmed to varying levels and varying hole depths—all on the same workpiece. A dial-control-panel and a tape reader are mounted integrally with the machine. Tape preparation is simple.

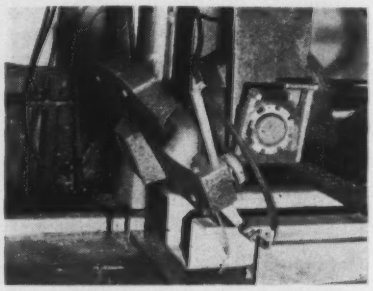


Using a hand punch, an operator punches about 100 hole positions per hour. (Hillyer Corp., Booth 304)

For more data circle No. 43 on postcard, p. 175

High-Speed Saws

Radial arms allow high-speed saws to cut non-ferrous metals at various angles. Equipped with carbide-tipped blades, the saws have precision-controlled feeds and integrated mist-coolant. Use of these metal-cutting machines allows operators to slot, slit and bevel cut at any desired angle. (DeWalt Div., American Machine & Foundry Co., Booth 118)



For more data circle No. 44 on postcard, p. 175

Angular Cutters

Carbide-tipped angular cutters mill angular grooves and dovetails. The 45° angular cutter has carbide tips to facilitate regrinding without grinding steel cutter body. The series of cutters handle steel, cast iron, brass, bronze, and similar non-ferrous materials. The teeth of the cutters have 0° rake. (Brown & Sharpe Mfg. Co., Booth 1131)

For more data circle No. 45 on postcard, p. 175

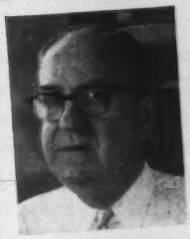
Fabricator

Having a throat-depth capacity of 30 in., a single-station, high-speed punch press features an adjustable table which permits the use of pedestal dies. These enable the

They All Agree... You Can't Beat a Simonds High Speed Steel Metal Cutting Band Saw

Tom— the band saw operator, says:

"With Simonds saws I get straight, accurate cuts with a smooth finish."



Dick— the production manager, puts it this way:

"Since we've been using Simonds we lose lots less downtime for blade changes. Simonds blades seem to stand up better under high speeds and heavy feeds. Our cut-off production results are better."

and Harry— the purchasing agent, says:

"We've been using Simonds bands for some time now. I like the easy availability from our local distributor. We don't have to wait for delivery or for service."

Why not put a Simonds High Speed Steel Metal Cutting Band to work for you and find out how much better it really is? Call your Simonds Distributor now.

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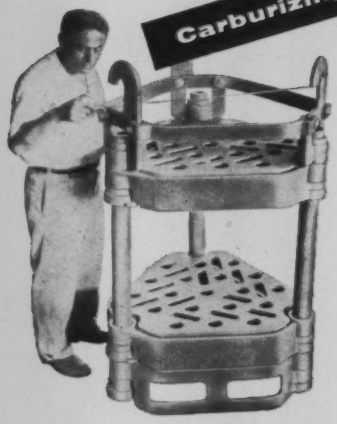
FITCHBURG, MASS.
SIMONDS Industrial Supply DISTRIBUTOR

Factory Branches in Boston, Chicago, Shreveport, La., San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

35% NICKEL
DURALOY
15% CHROMIUM
Furnace Castings

Here are two good examples of our work in high-nickel castings!

These are in the Duraloy HT group calling for Ni 33.37 percent. We've gone as high as 68% nickel on some castings where extremely high temperatures and very severe corrosive conditions had to be resisted. The important factor concerning castings for exceptionally high temperatures is that they must retain their structural form under load.



Knowing just how much nickel to put in and how much chromium and other alloying elements depends to a large extent on experience . . . and it is experience that we can offer you for the castings you need. We've been producing static castings since 1922 and centrifugal castings since 1933, being among the pioneer founders in each class.

If you would care to have our metallurgist study your casting problem, we shall be glad to have you call upon us for the service.

Our New General Catalog is yours for the asking.

HIGH ALLOY CASTINGS

The DURALOY Company
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CHICAGO OFFICE: 332 South Michigan Avenue
DETROIT OFFICE: 23906 Woodward Avenue, Pleasant Ridge, Mich.

operator to punch holes in angles, shapes and formed parts. For straight-line punching, the machine can handle a 30-in. workpiece of any length, utilizing a multiple-stop

gaging system. An important accessory, the duplicator, allows for production punching, a maximum work size of 25 x 30 in. (Wales Strippit Inc., Booth 1221)

For more data circle No. 46 on postcard, p. 175

Bandsaw Machine

Maintaining positive cutting pressure at all times, a horizontal bandsaw centralizes all controls at a control console. The bandsaw machine has a large rectangular capacity of 14 x 24 in., a hydraulically-driven

blade, clockwise rotation of blade, and a convenient machine height of 36 in. Other features include: center cutting position, dual movable vise jaws, and adjustable blade tension. (Machine Tool Div., Kalamazoo Tank & Silo Co., Booth 300)

For more data circle No. 47 on postcard, p. 175

Grinding Attachment

Built for mounting on heavy-duty lathes, mills, planers, or other machine tools, an abrasive-belt grinding attachment is capable of heavy stock removal. It also gives

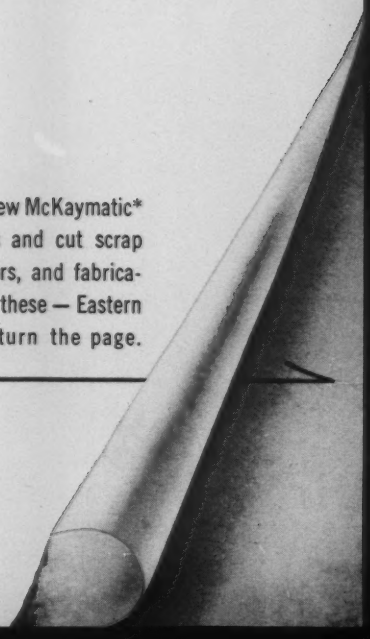
in 1960...

LOOK TO

McKAY MACHINE

FOR PROGRESS IN METAL PROCESSING

FOR EXAMPLE, the revolutionary new McKaymatic* Die Shear Line that has reduced costs and cut scrap losses for many steel makers, warehousers, and fabricators. For the complete story on one of these — Eastern Stainless Steel Corporation—please turn the page.



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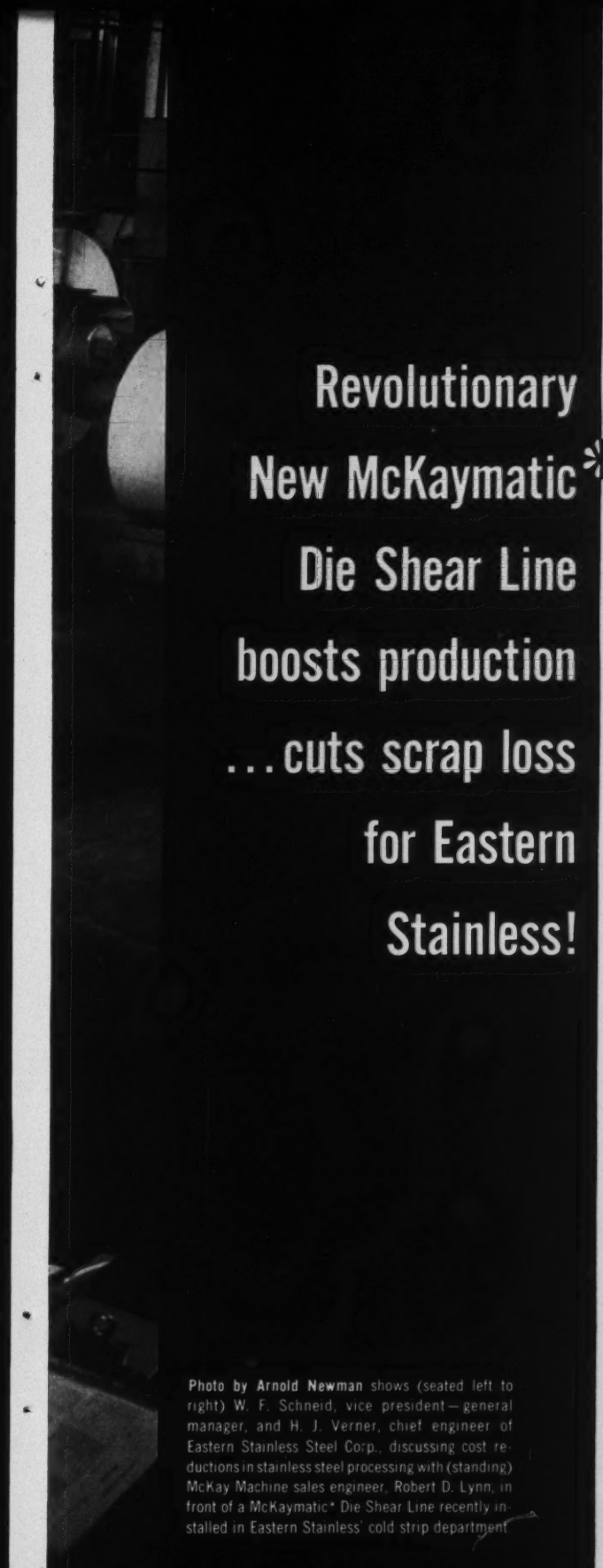


Revolutionary New McKaymatic* Die Shear Line boosts production ... cuts scrap loss for Eastern Stainless!

Photo by Arnold Newman shows (seated left to right) W. F. Schneid, vice president—general manager, and H. J. Verner, chief engineer of Eastern Stainless Steel Corp., discussing cost reductions in stainless steel processing with (standing) McKay Machine sales engineer, Robert D. Lynn, in front of a McKaymatic* Die Shear Line recently installed in Eastern Stainless' cold strip department.

"We consider the McKaymatic* the finest advancement in shearing to come along in a great many years," says W.F. Schneid, vice president-general manager, of Eastern Stainless Steel Corporation, Baltimore, Md. "We have reduced production time, cut our scrap loss, and have recorded an overall increase in department efficiency as a direct result of this new McKay die shear line," Mr. Schneid continues.

Eastern Stainless is a prime supplier of stainless steel sheets, strip and plates, for aircraft and missile parts, for food, chemical, paper and textile machinery and for architectural uses. It produces 25 grades of stainless steel in its own modern electric furnace facilities, and ships about sixty-six percent of it in sheet form.

Programs many grades instantly—Through improved roller leveler techniques, Eastern Stainless found it was able to instantly program many grades of sheet through its new McKaymatic* Die Shear Line. The line decoils, levels in a 17-roll McKay Roller Leveler, measures by electronics and cuts to length—replacing a cut-up, re-level, and re-square operation prior to boxing. Production of cut lengths has been substantially increased.

The result, they report, is cost savings. Says Mr Schneid: "As a result of our efforts to improve customer service, we installed this line to speed up production of these cut lengths. It has enabled us to break a production bottleneck for which there seemed to be no solution."

Line eliminates stretcher leveling—Mr. Schneid continued that production time has been reduced on sheets of five grades as a result of being able to eliminate stretcher leveling and re-squaring procedures. Also, he said, the scrap loss on re-squaring has been eliminated as the sheets are cut clean and square on the McKay line. Net effect of the installation was a definite increase in overall departmental efficiency.

H. J. Verner, chief engineer, remarked that the McKay roller leveler could process these grades of stainless, within its capacity, to flatness approaching that obtained from the stretcher method. He reported that the Die Shear Line is being used to prepare for shipping cold rolled sheet from 4" to 48" in width, up to .050" in thickness, and in lengths from 36" and greater at normal production speeds. He particularly likes the McKaymatic* Die Shear Line for its ability to handle high finish stainless without edge or surface damage.

Available in many sizes—The McKaymatic* Die Shear Line is available in sizes to accommodate most commercial widths. Composed of decoiler (with coil car, if desired), roller leveler, measuring device, and cutoff press, it satisfies most requirements for sheet length accuracy and squareness, flatness, edge and surface quality protection and output rate.

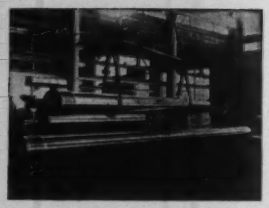
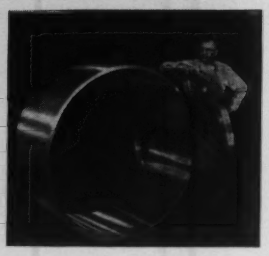
For short runs or long, the McKaymatic* Die Shear Line will better any other line in economy and efficiency. Whatever your cut-to-length problem, McKay Machine's engineers have a solution. Write for literature; send your specific needs for a quotation to *McKay Machine Company, Youngstown 1, Ohio.*

*TM

LOOK TO

McKAY MCK MACHINE

FOR PROGRESS IN METAL PROCESSING

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Your machine parts, ferrous or non-ferrous, are subject to stress, strain and friction, day after day, year after year . . . so specify Shenango . . . and see what a difference this makes!

Shenango's centrifugal casting process insures longer life because of finer, more uniform, *pressure-dense* grain to begin with . . . free of inclusions, porosity, blowholes and other weakening defects. Then, far less machining is needed and your part is stronger . . . to last and last *and last!*

Shenango's modern and fully-equipped shops will supply you with ferrous or non-ferrous symmetrical parts in virtually any shape or size . . . rough, semi-machined or precision-finished to your most exacting specifications. For full details, write: *Centrifugally Cast Products Division,* The Shenango Furnace Company, Dover, Ohio.

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COPPER, TIN, LEAD, ZINC BRONZES • ALUMINUM AND MANGANESE BRONZES
MONEL METAL • NI-RESIST • MEEHANITE METAL • ALLOY IRONS

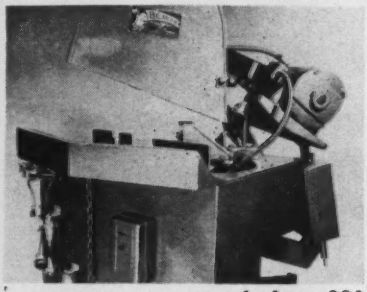
PREVIEWS

close tolerance size control, and low micro-inch finishing, limited by accuracy of machine on which it is installed. Equipped with heavy taper-nose spindle, the grinding machine uses contact wheel 12-in. diam and abrasive belts up to 4-in. wide, 86-in. long. (Production Machine Co., Booth 1922)

For more data circle No. 48 on postcard, p. 175

Cutoff Machine

Providing complete uniformity of cut, an any-angle abrasive cut-off machine has an air-operated power head. A swivel head enables the

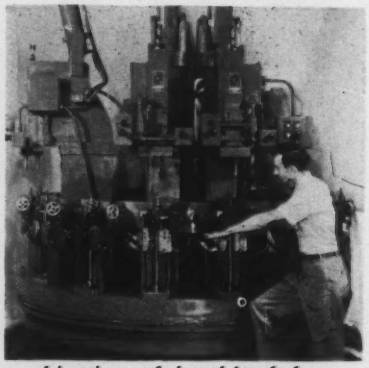


operator to cut any angle from 30° to 90°, and permits material to be fed from the same point regardless of the angle being cut. (Beaver Pipe Tools, Inc., Booth 1416)

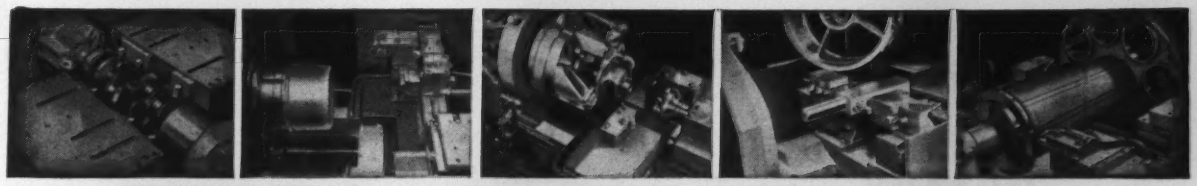
For more data circle No. 49 on postcard, p. 175

Assembly Machine

A circular assembly machine finds use for assembling such items as pumps, motors, and transmissions; or any assembly requiring a

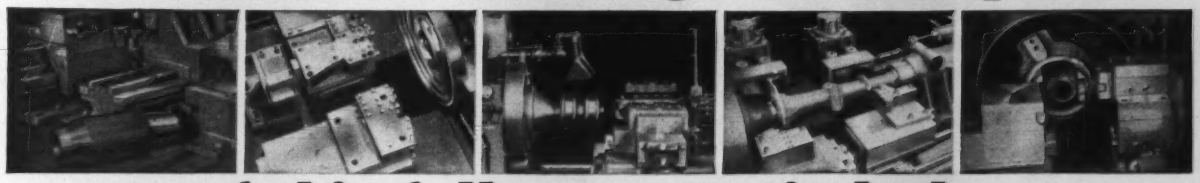


combination of hand-loaded parts and automatically hopper-fed parts. The machine also performs operations such as pressing, spinning, and screwdriving. The circumference of the machine serves as a work area,



All these different tooling setups

show the amazing versatility



# of this fully automatic lathe

...the SIMPLIMATIC

Here's versatility that beats any automatic lathe you ever saw! Actually, the Simplimatic is doing hundreds of jobs like these—jobs that would otherwise be put on *special* machines—built at extra-special cost. But this (and don't miss the important point!) is a *standard machine*—at a *standard price.*

If you have medium or long runs on parts up to 36¼" in diameter, get the facts about the Simplimatic Automatic Lathe.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

MMT=PE

THIS CATALOG may show you how the Simplimatic can save thousands of dollars for you as it is doing for many others. Write for your copy.

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Madison 10, Wisconsin
Gentlemen:
Please send my copy of the Simplimatic Catalog.

Name.....*Title*.....

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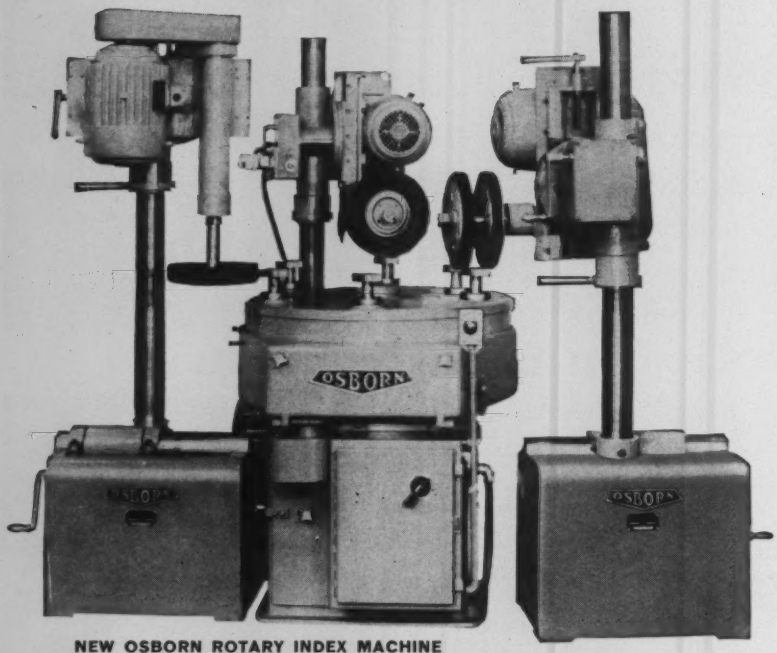
City.....*Zone*....*State*.....

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY-REBUILT MACHINES WITH NEW MACHINE GUARANTEE

To cut your metal finishing costs...

NEW—
OSBORN ROTARY INDEX MACHINE



NEW OSBORN ROTARY INDEX MACHINE
Units can range from manual to fully automatic operation

Unique "building block" design means unlimited production flexibility

NEWEST ADDITION to Osborn's broad line of metal finishing machines are these Rotary Index units. Capability: significant increase of your production capacity.

Most important feature—production men can economically "build" *custom* metal finishing machines from *basic "building block"* components . . . finishing heads, index tables and electric controls. Other advanced design and construction features make these new Osborn Metal Finishing Machine units worth your immediate investigation.

Your Osborn field specialist has latest application data on a wide range of cost-saving finishing methods. And an Osborn Analysis—made in your plant—is the first step to pinpoint savings on *your* operations. Write for details. *The Osborn Manufacturing Company, Dept. F-94, Cleveland 14, Ohio.*

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Booth 1305

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METAL FINISHING MACHINES . . . AND FINISHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

and the entire machine diameter is open and accessible for safety, loading and maintenance. (Precision Detroit Co., Booth 661)

For more data circle No. 50 on postcard, p. 175

Radial Drill

Double-end, 2-level radials permit one operator to be setting up large workpieces on the low base, while a second operator drills smaller work on the work-height

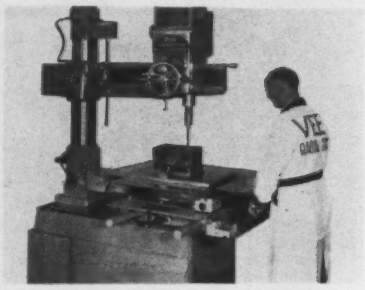
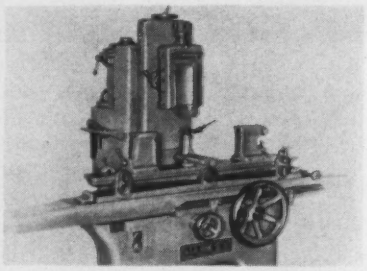


table at the opposite end. Designed for the heaviest drilling loads, an 18- x 24-in. tee-slotted, universal-angle work table indexes 45°, either side of horizontal. (Veet Industries, Booth 904)

For more data circle No. 51 on postcard, p. 175

Grinder Reams and Cuts

Particularly suited for grinding primary and secondary clearances on milling cutters, end mills, reamers, metal-slitting saws and counterbores, a versatile grinder performs

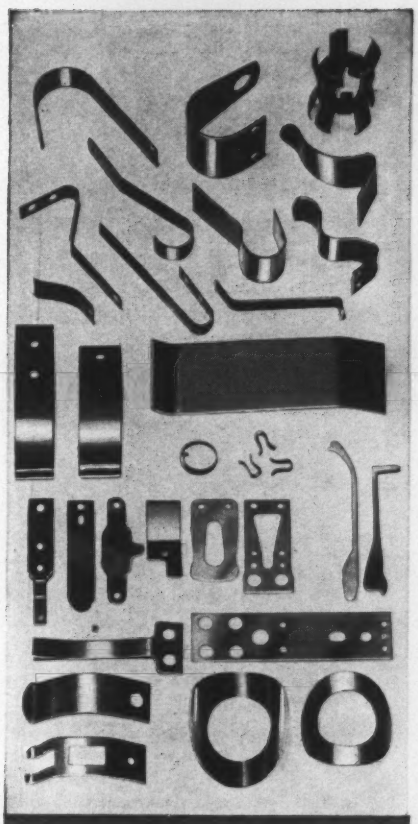


cutting and reaming operations. Teeth on cylindrical-ground tools may be cleared on the grinder to provide a predetermined cylindrical margin. (Hartex Div., Union Twist Drill Co., Booth 1927)

For more data circle No. 52 on postcard, p. 175

Inspection Instruments

Similar to miniature, illuminated periscopes, a line of inspection instruments closely inspects impos-



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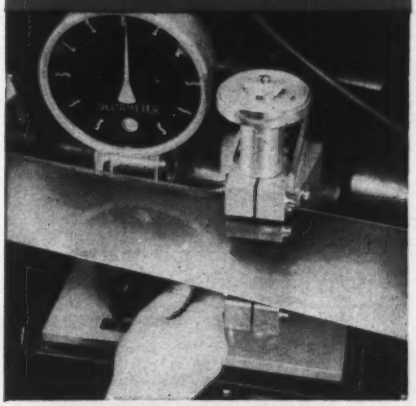

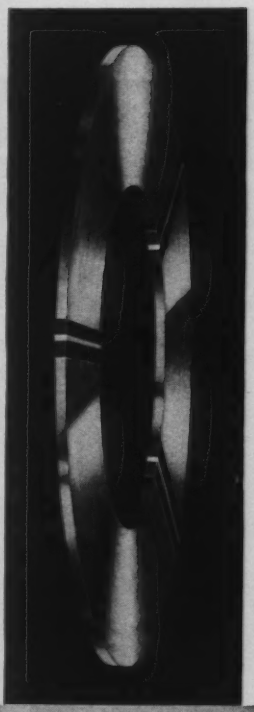

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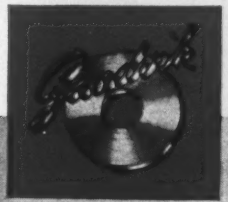

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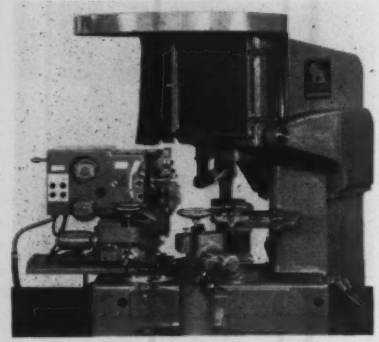
PREVIEWS

sible-to-see interior surfaces. The instruments vary in diameter from 0.095 to 1.000 in., and they provide vision in various directions. (Engelhard Industries, Inc., Booth 2144)

For more data circle No. 53 on postcard, p. 175

Profile Grinder

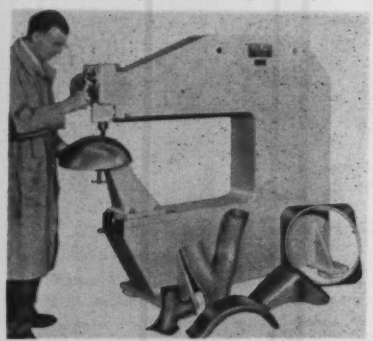
Featuring automatic longitudinal and/or cross travel, an optical profile grinder permits fully-automatic grinding of flat faces; also, the grinding of irregular profiles. The machine has a 20- x 20-in. shadowgraph screen with two magnifications of 25X and 50X. The grinding-wheel slide has a stroke of 3-5/16 in. The unit has an optical system for shadowgraph projection and one for reflection projection. (Eric R. Bachmann Co., Inc., Booth 1055)



For more data circle No. 54 on postcard, p. 175

Trimmer

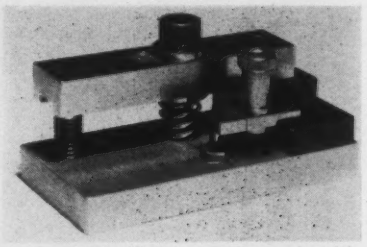
A heavy-duty trimmer, edge trims and finishes bulky stampings and deep-drawn parts. It operates with a stationary lower tool and a reciprocating upper tool that leaves a clean edge requiring no further finishing. Throat clearance is a total of 23 in. The trimmer has a capacity of 7/32 in. in mild steel. Accessories added to the machine provide the performance of all standard operations. (American Pullmax Co., Inc., Booth 827)



For more data circle No. 55 on postcard, p. 175

Stainless Tool Clamps

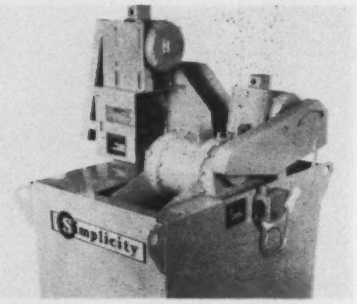
Available in sliding-swivel, flat-sliding and swinging - taper - nose models, a complete line of stainless-steel tool clamps meet a wide variety of uses. All clamps are hardened and heat treated. (PIC Design Corp., Booth 742)



For more data circle No. 56 on postcard, p. 175

Vibra-Washer Units

Vibrating work carriers automatically convey metal parts through cleaning or conditioning baths in washer units. The units clean so thoroughly that chips, oil and grease are even removed from



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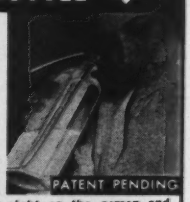

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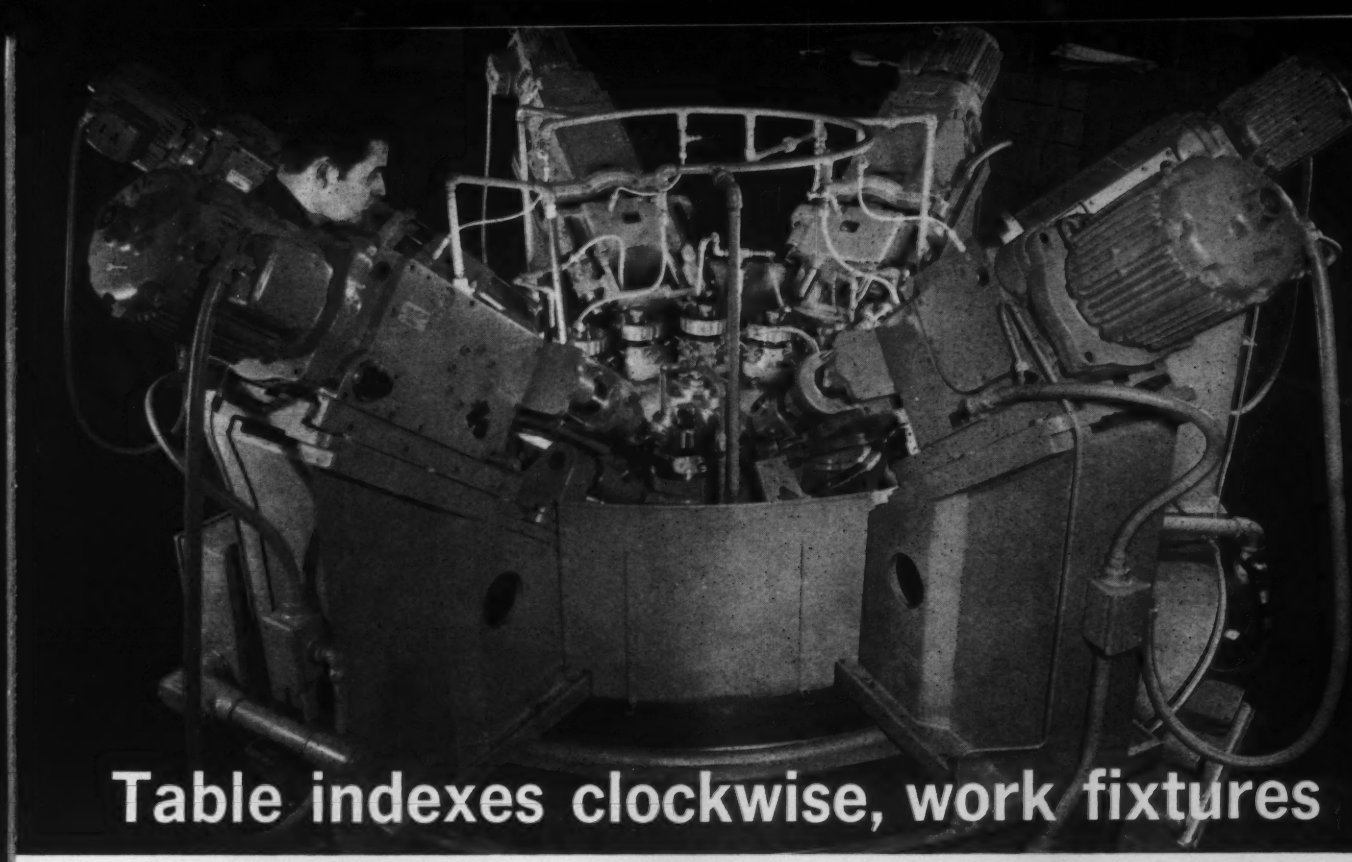


Table indexes clockwise, work fixtures counterclockwise for 6 holes 60° apart

Kingsbury machine drills and c'bores 135 steel forgings per hour gross

Problem: C'bore and drill six angular holes 60° apart in a forged steel gear.

Solution: Six drilling units with two-spindle heads are mounted on angular columns 60° apart on a circular base. An index table holds 12 work fixtures that do not turn with reference to any fixed point. As the table indexes clockwise 30°, each fixture indexes 30° counterclockwise. The work remains clamped as it indexes.

Each unit operates two tools downhill at a 27° angle. The first tool counterbores .1562 diam. at one station for an accurate start. The second drills .0397 diam. through at the next station. The operator changes parts in his fixture while the units perform their automatic cycles. Two tools operate at the same time on the part at the rear station.

Uniform Parts that Gage Maybe this seems simple. But it takes some doing to . . .

— build 12 fixtures that are exact duplicates, each one to hold the work firmly and accurately;

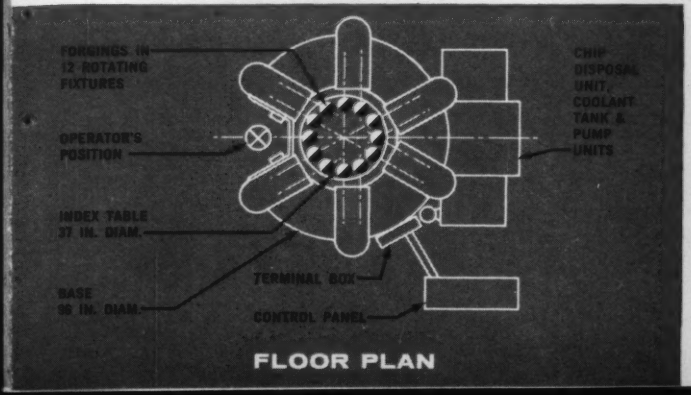
— remove backlash from the gears that index the fixtures;

— start angular holes straight and in exact position.

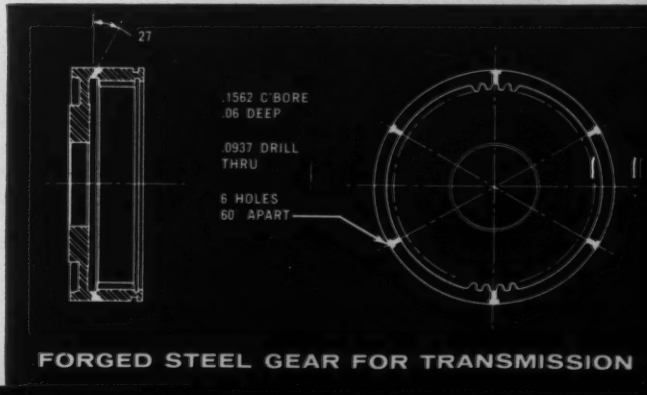
We specialize in solving such problems. Our machines have good basic design and accurate rugged construction to produce uniform parts that gage.

May we make you a proposal? You can then place one order for the entire machine and make us fully responsible that it meets your specifications. Kingsbury Machine Tool Corp., Keene, New Hampshire.

KINGSBURY MULTI-UNIT AUTOMATICS



FLOOR PLAN



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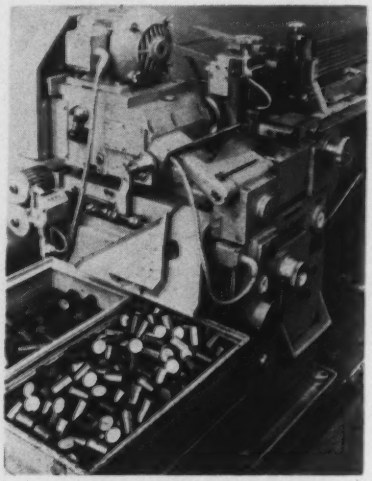
blind or slotted openings. Yet, cleaning is so gentle that delicate threads and flanges aren't harmed. (Simplicity Engineering Co., Booth 2215)

For more data circle No. 57 on postcard, p. 175

Automatic Saw

An automatic-saw cuts over 4500 brass slugs per hour—and separates scrap at the same time.

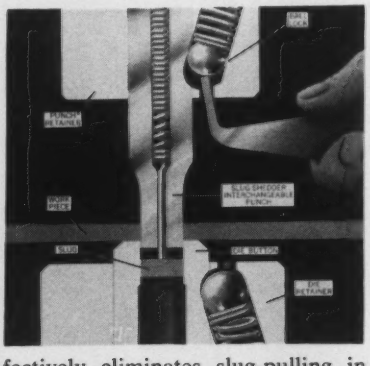


The high-speed, cold-sawing machine offers automatic loading, infeeding, squaring, cutting and discharge of finished pieces. (Albert Klingelhofer Machine Tool Corp., Booth 1860)

For more data circle No. 58 on postcard, p. 175

Slug-Shedder Punch

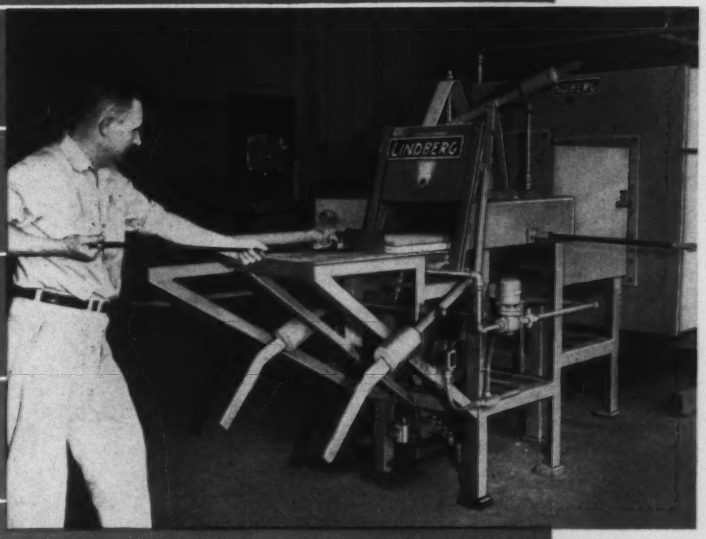
With round points available from stock in diameters ranging from 1/16 to ⅝ in., a new punch ef-



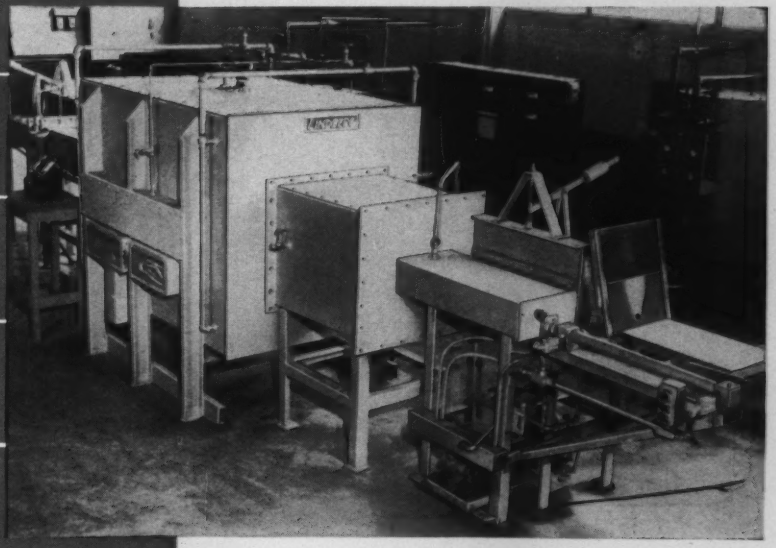
fectively eliminates slug-pulling in any die—regardless of the type or thickness of the material being

NEW LINDBERG FURNACE PROVIDES IMPROVED EFFICIENCY FOR STAINLESS STEEL SINTERING

This Molybdenum Element Atmosphere Pusher Type Furnace embodies high temperature refractories suitable for low dew point without muffle

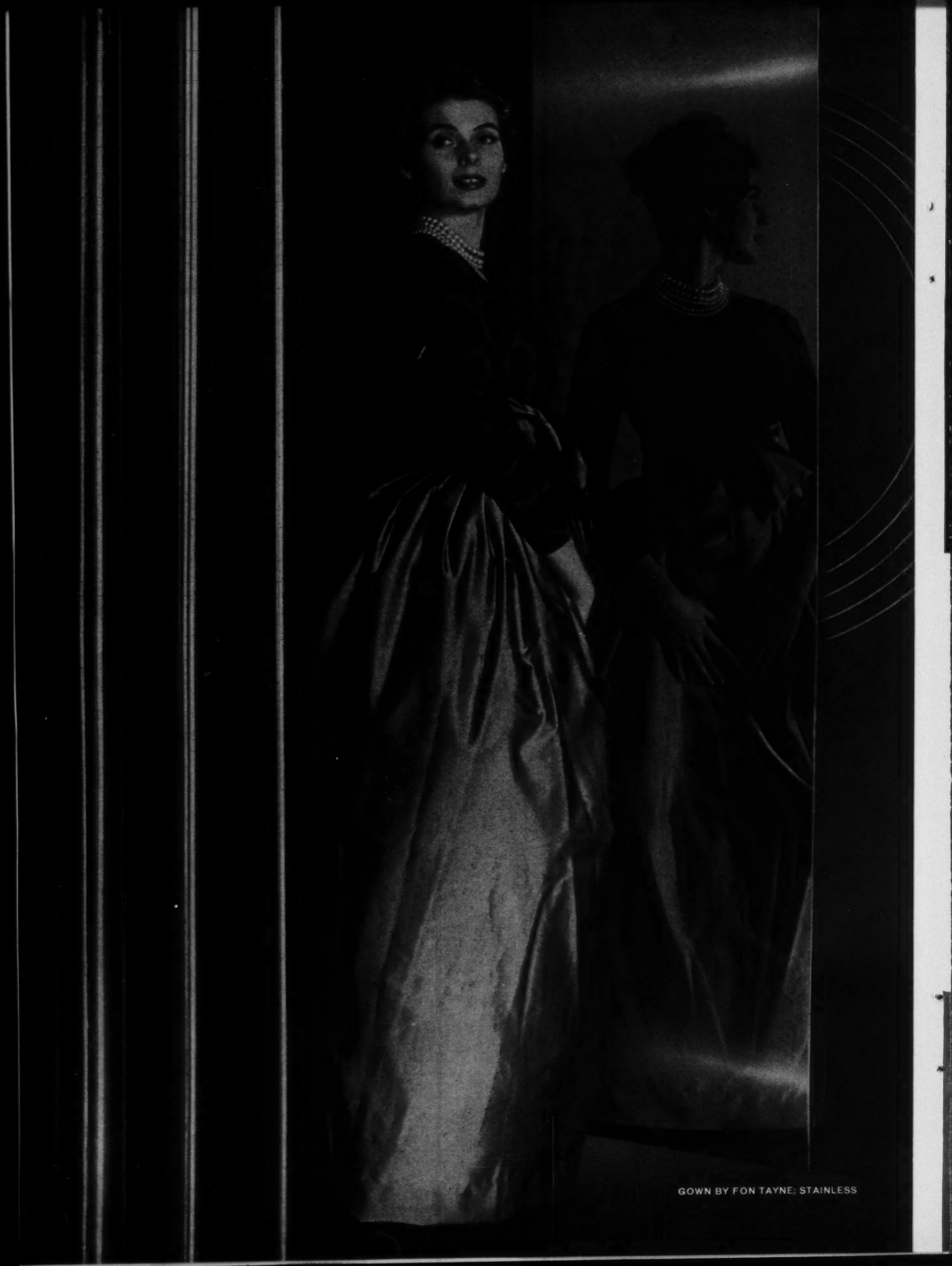


This new furnace provides an improved method for sintering stainless steel compacts in hydrogen or dissociated ammonia. A development of Lindberg's engineering staff, you can depend on the most efficient, economical and trouble-free service from it. Furnace provides side loading and discharge parts with purging chambers. Work trays, ceramic slabs or molybdenum boats, move through the furnace by hydraulic pusher. In the installation illustrated below ammonia dissociator and control panels are shown at the right. Hydrogen supply cylinders are located outside the building. For full information on this and Lindberg's complete line of sintering and brazing furnaces just get in touch with your local Lindberg Field Representative (see classified phone book) or write us direct. Lindberg Engineering Company, 2452 West Hubbard Street, Chicago 12, Illinois.

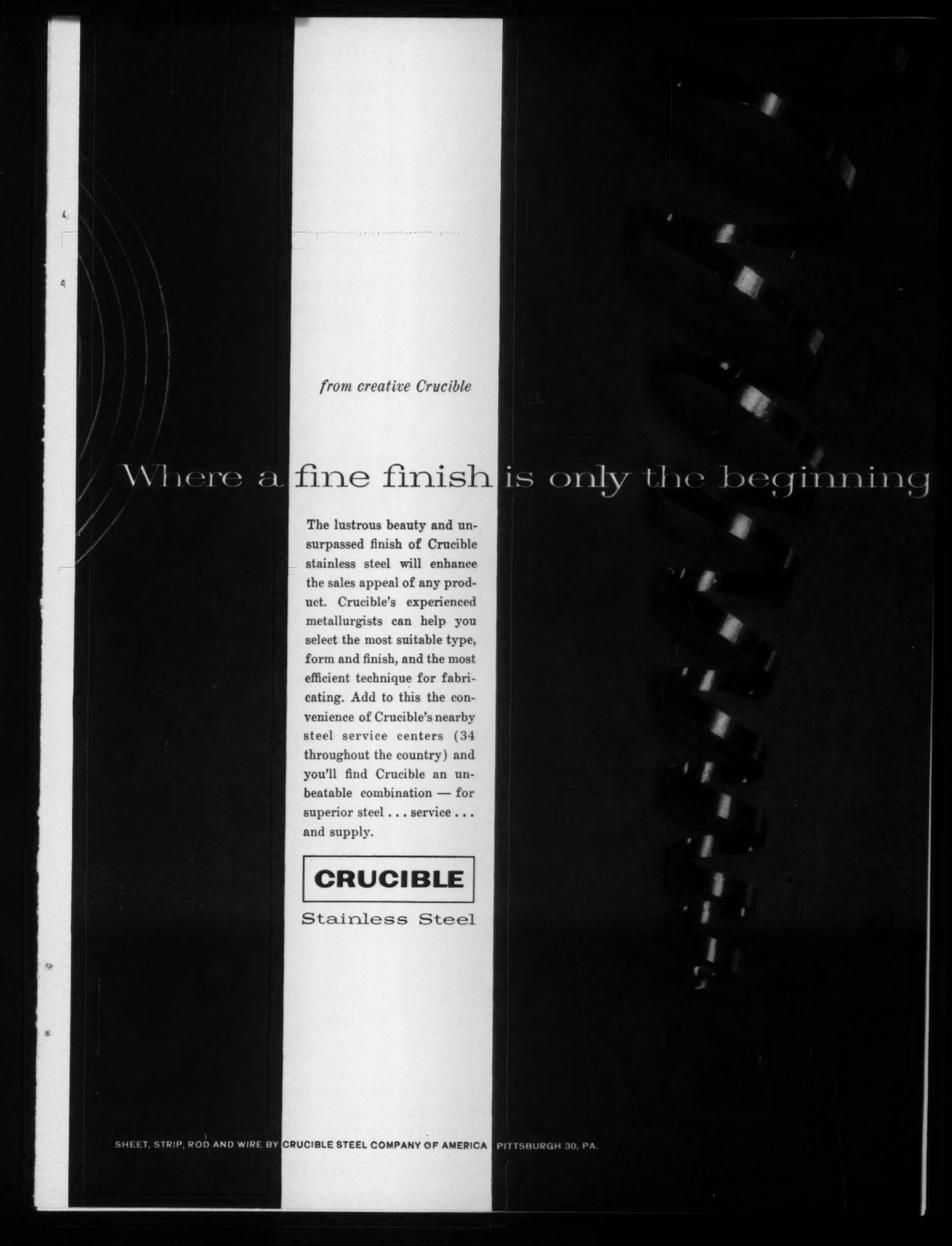


Type MOP-12307-A80C Molybdenum Element Atmosphere Pusher Furnace. Maximum Temperature 3000°F. 80 KW input. 12" wide, 30" long, 7" high. 60" cooling chamber, 36" long preheat chamber.

LINDBERG **heat for industry**



GOWN BY FON TAYNE; STAINLESS



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CRUCIBLE

Stainless Steel

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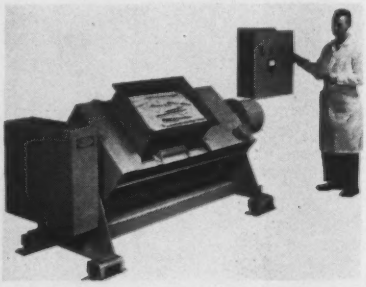
STEELS, INC.
THE 52100 HOUSE
UNION, NEW JERSEY · WETHERSFIELD, CONNECTICUT
DETROIT, MICHIGAN · MELROSE PARK, ILLINOIS

pierced. A coil spring, mounted in the punch point, compresses on the down-stroke. On the up-stroke, the spring pushes the slug away from the punch. (Richard Bros. Punch Div., Allied Products Corp., Booth 1814)

For more data circle No. 59 on postcard, p. 175

Mechanical Deburring

Employing controlled vibration, a vibrator precision finishes a broad range of types, shapes, and sizes

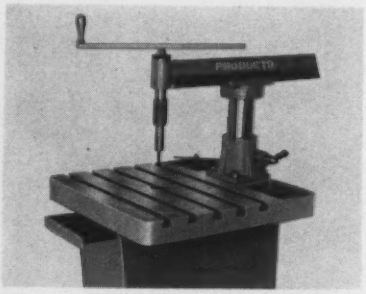


of metal, plastic, and wooden parts. In addition to cleaning, descaling, deburring, radiusing, fine finishing, and coloring, the machine also gives interior finishes as well as ball burnishing. The vibrator is push-buttoned controlled. (Lord Chemical Corp., Booth 861)

For more data circle No. 60 on postcard, p. 175

Hand Tapper

For hand tapping, a new machine features a jointed spindle arm which allows access to all areas of the square work table; also, off-the-table areas at the back of the machine. The overarm is adjustable vertically from minimum to maxi-



mum height when tapping irregular-shaped parts. Tapping range is from #8 to ¾-in. standard, and ⅛- to ½-in. pipe taps, which are

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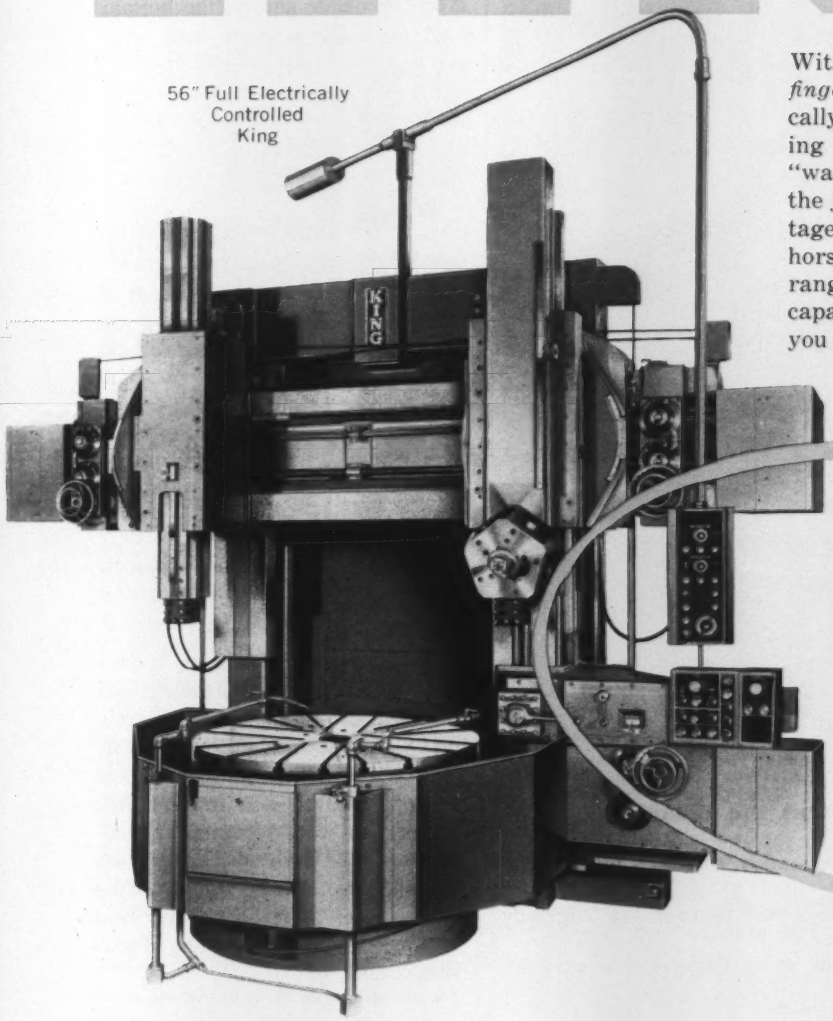
WITH THE NEW **FULL ELECTRICALLY CONTROLLED**

KING



56" Full Electrically Controlled King

With all controls literally *at the operator's fingertips*, these new KING® Full Electrically Controlled Vertical Boring & Turning Machines eliminate costly operator "waste-motion" in setting up and running the job. Add to this King's design advantages of increased machine rigidity, higher horsepowers, expanded speed and feed ranges—giving you full advantage of the capabilities of modern cutting tools—and you have

the greatest productive capacity ever achieved for your vertical boring and turning work.

Here's what FULL ELECTRICAL CONTROL gives you—

Direction of Head Movements by simplified "up-down" and "in-out" switches right on the pendant

Pushbutton control of feed and rapid traverse of heads, and of rail raising and lowering

Pre-selective feed and speed selector dials, permitting operator to set the next feed or speed while a cut is being taken

24 feeds from .0016" to .250" and 24 table speeds

AND

Still MORE "Automation" is available with these optional added features—

Automatic Feed Stops . . . "Ultra-Matic"® Programming . . . Automatic Tracing Control of Heads . . . Power Indexing of Turrets

For further details on KING Full Electrically Controlled Machines—in sizes 30", 36", 46", 56", and up—see your authorized KING Distributor, or write to us direct.

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ATLAS CAR & MFG. COMPANY

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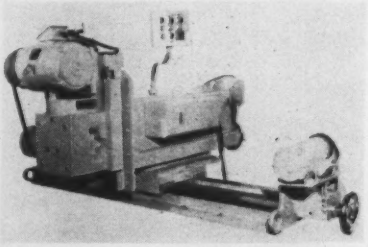
CLEVELAND 10, OHIO

held in 1-in. diam individual tap holders. (Producto Machine Co., Booth 1144)

For more data circle No. 61 on postcard, p. 175

Milling Machine

Ideal for performing deck-type milling, a ram-type portable milling machine features a 10-hp spindle and power screw feeds on the ram-type cross slide and on the bottom



slide. The screw feeds provide feed ranges to accommodate all types of milling operations. The spindle adjusts vertically to provide for spindle positions up to 18 in. above the base, and as low as 9 in. below the base. The machine can also be used for milling on large stationary work. (Master Mfg. Co., Inc., Booth 2239)

For more data circle No. 62 on postcard, p. 175

Indexing Chassis

To automate production, inspection, or assembly lines, tooling and mechanisms are applied to an automatic straight-line indexing chassis. This self-contained unit is indexed by a cross-over cam transmission, which gives very accurate positioning of the work piece at each station. The cam also eliminates the necessity of pilot or floating type tooling. (Sylvania Lighting Products, Booth 1615)

For more data circle No. 63 on postcard, p. 175

Autocollimator

An autocollimator measures angular deviations of as much as 10′ to an inherent accuracy of ½″. It finds use for checking the flatness of surface plates, straightness of ways, squareness of angle plates, trueness of bearings, and it solves other common shop problems. Mea-

suring 26½-in. overall, it incorporates a 16-in. focal-length objective. (Gaertner Scientific Corp., Booth 845)

For more data circle No. 64 on postcard, p. 175

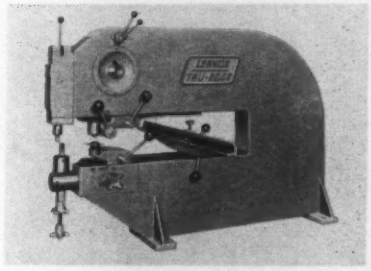
Marking Device

Equipped with a carbide stylus, an air tool marks all ferrous and nonferrous materials, glass, ceramics and plastics. The device operates on 40- to 100-lb pressure and uses 1 cu ft of air at 90 lb. The tool produces the mark by a peening action, therefore not structurally weakening the pieces being marked. (The Rotor Tool Co., Booth 1938)

For more data circle No. 65 on postcard, p. 175

Shearing Machine

Equipped with a ½-hp, 110-v, single-phase motor, a shearing and forming machine offers portability and ease of operation. The new



bench model has an edge-cutting capacity up to 12 gage in mild steel, and 16 gage in stainless steel. The unit cuts from 8 to 15 ft of material per minute. The machine is 49½-in. long 32½-in. high, and 14½-in. wide. Circle-cutting capacity is 3- to 30-in. diam. (Lennox Tool & Machine Builders, Booth 846)

For more data circle No. 66 on postcard, p. 175

Finishing Tool

Handling up to 2½-in. ID tubing, a tube-end finishing tool performs three operations in one cycle —chamfer, OD and ID, and end face. A spring-loaded, carbide cone tip contains the cutting blade. Upon contacting the work, the cone retracts, exposing the blade for cutting. One tool can handle a range

PRECISION PRODUCTION PROBLEMS?

Here's help from Bausch & Lomb

in TOOL DESIGN
INSPECTION
FABRICATION
MEASURING
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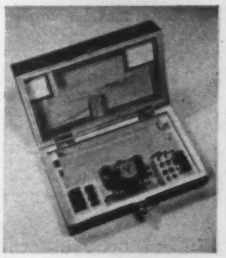
TOOLMAKERS' MEASURING MICROSCOPE

Quickly measures transparent or opaque objects of any contour. Linear, accurate to 0.0001"; angular, to 1 minute of arc.

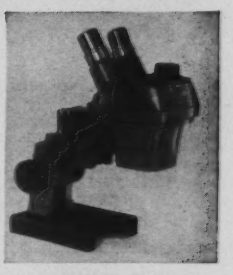


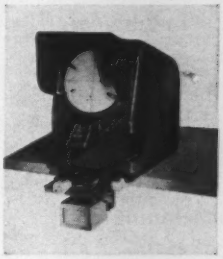
NEW UNIVERSAL STAGING FIXTURE

Positions small parts for critical measurement with B&L Bench Comparator and Toolmakers' Microscope. Auxiliary base, with 7" travel, increases range beyond that of measuring stage.

STEREOZOOM* MICROSCOPES

Magnified 3-D views of tiny parts. Dustproof, shockproof, can be mounted right in machine or fixture. Speeds assembly, inspection. Most complete line, widest field of view.



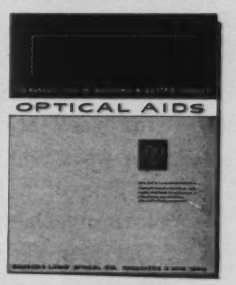


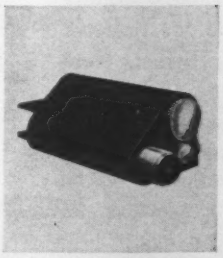
BENCH COMPARATOR

Exclusive understage illumination—no complex set-ups, no holding fixtures for most work. Magnified silhouettes, show errors instantly. Reads to 0.0001" with optional micrometer stage.

OPTICAL AIDS CATALOG

Time-and-money-saving data on Surface Comparators, Industrial Magnifiers, Macroscopes, Micrometer Discs, Brinell Microscopes, Microscope Bodies, Wide Field Tubes, Shop Microscopes.





NEW SCRATCH-DEPTH GAGE

With this simple hand-held instrument you can measure the depth of any scratch to 0.0001", with a range of 0" to 0.015"

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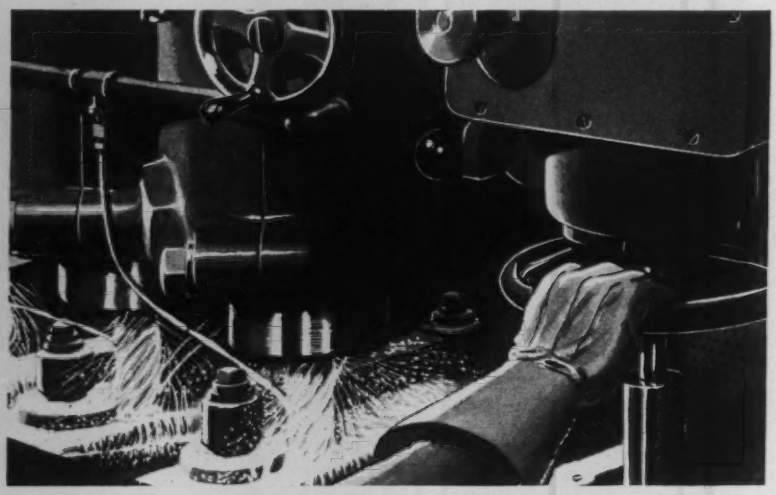

Oakite Formula 59 cutting solution fights rancidity . . . lasts longer

Most soluble oil cutting solutions are thrown out before they're worn out. When they turn so rancid that operators can't stand the smell, they're replaced. Understandable . . . and wasteful. But using Oakite 59 is far more economical. It *resists* rancidity, lasts far longer—especially in summer, helps protect workers from infection, cuts cost.

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One of a line of Oakite lubricants for machining and forming, Oakite Formula 59 is a specialized material—as all Oakite products are. Ask the Oakite man about those designed for your operations, your products. And send for Bulletin A-9864. Oakite Products, Inc., 34E Rector Street, New York 6, N. Y.

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PREVIEWS

of sizes by changing blades. (Cogsdill Tool Products, Inc., Booth 211)

For more data circle No. 67 on postcard, p. 175

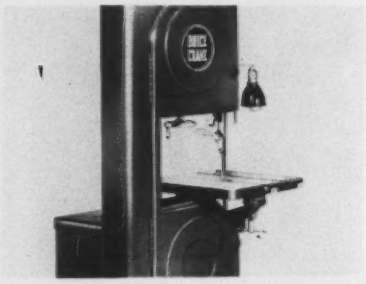
Horizontal Press

Design of a super-high-speed horizontal press incorporates a vertical crankshaft with flywheel and clutch in the base of the machine—for low center of gravity. This press is particularly adaptable for strip feeding from a magazine. (Emhart Mfg. Co., Booth 1944)

For more data circle No. 68 on postcard, p. 175

Contour Saw

A 14-in. contour saw is utilized wherever the tool must be easily shifted in-and-out of a temporary production set-up, or on small work pieces where work is best performed on an appropriately-sized machine. It also finds use on main-



tenance work where it is desirable to move the machine to the job site. Besides cutting steel and other industrial materials, the machine, with a change of tools, files, file broaches, grinds or polishes. (Boice-Crane Co., Booth 744)

For more data circle No. 69 on postcard, p. 175

Lapping Machines

Detachable abrasive tanks on precision automatic - lapping machines cut "down time" to a negligible factor. Finished parts can be slid off the lapping plate onto the circular working area for fast quantity removal. In all lapping and finishing operations, parts are retained and guided—100 pct of the time. (Spitfire Tool and Machine Co., Booth 552)

For more data circle No. 70 on postcard, p. 175

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STAINLESS STEELS

The durable gleam of stainless steel flatware, utensils and kitchen accessories is mighty welcome. Today's homemaker knows and appreciates stainless for what it is—the *one* metal that always cleans fast and easy, never loses that *just-bought* beauty.

Specify Uniloy Stainless Steel. It's the high quality stainless that's easy to work and form. Made by one of the nation's leading specialty steel producers, Universal-Cyclops Stainless is rolled to your exact specifications.

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ASTME TOOL SHOW

Tool Experts Meet

Next week Detroit will play host to the American Society of Tool and Manufacturing Engineers. Conferences and exhibits will run from April 21-28.

A series of 35 seminars, panels, symposia, "Techtours" and technical sessions are scheduled.

■ To those seeking productivity know-how, the 1960 ASTME Exhibit serves well as a source of such knowledge. This large exhibit of metalworking equipment and techniques can be found in the Detroit Artillery Armory, spread out over seven acres. The $15,000,000 worth of processing and equipment consists of over 6000 products; of these, 900 have never been seen before and 1300 are new within the last year. Besides seven acres of exhibit, there will be over a thousand specialists, whose only purpose will be to answer the visitor's questions. The specialists represent the full gamut of technological manufacturing.

Topical Highlights—The Conference will present over 70 technical papers and panel discussions on an array of topics. The subject matter ranges from automation and milling Zircaloy to the contribution of engineers to surgery.

Visitors to the tool show will be offered 17 plant tours. The tours will cover everything from salt-mine operations to lens-grinding techniques on a production basis.

Six internationally-known scientists and industrial engineers, accredited with outstanding accomplishments in creative manufacturing, will be honored by the ASTME at an "honor awards" dinner. The dinner has been planned as part of the activities during the Conference and Exhibit.

A two-day seminar will analyze and evaluate the latest measuring concepts in tooling and manufacturing.

ASTME TECHNICAL PROGRAM

Thurs., April 21—3:30 p.m.
Founders Room, Sheraton-Cadillac Hotel
MEDICINE - SURGERY - ENGINEERING

Chairman—K. G. Nowak, Fenwal Inc.

The Engineer in Medicine, by Dr. C. W. Walter (F.A.C.S.), Harvard Medical School, Peter Bent Brigham Hospital.

Rehabilitation Needs the Engineer, by W. C. Gorthy, C. E., Institute for the Crippled and Disabled.

Tooling for the Handicapped—A Challenge to Engineers, by J. W. Greve, THE TOOL ENGINEER Magazine, American Society of Tool and Manufacturing Engineers.

Fri., April 22—9:30 a.m.
Founders Room, Sheraton-Cadillac Hotel
SOME PRODUCTION CONSIDERATIONS

Chairman—K. O. Tech, The Cross Co.

The Turret Drill and Tape Control: An Unbeatable Cost-Cutting Universal Production Tool, by J. L. Burg, Burg Tool Mfg. Co., Inc.

Some Quality Considerations in the Design of Automatic Assembly Machines, by A. J. LaRue, IBM Corp.

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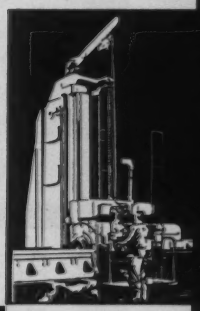

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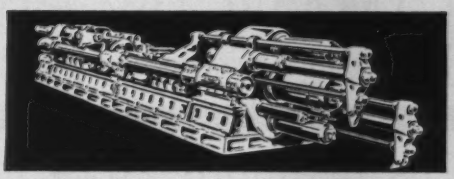
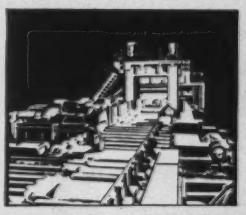
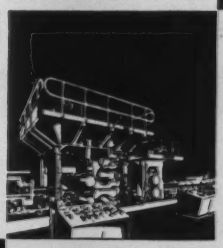
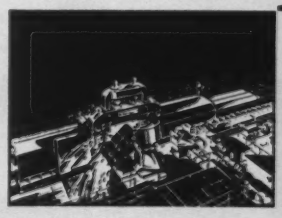
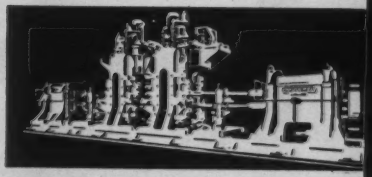
Large electrical furnaces for steel making
Manipulators for Martin furnaces
Forging presses
Continuous casting of steel and non-ferrous materials
Ingot hot peeling machines
Complete rolling mills for blooms and slabs
Rolling mills for billets, rails, bars and shapes
Sendzimir hot planetary mills for strips
Medium and small rolling mills for plates, strips, shapes, bars, round bars and wire rod
Sendzimir cold rolling mills for strips
Continuous mills for cold rolling of large strips and plates
Pickling and shearing lines
Rolling mills for seamless steel tubes
Plants for production of large diameter butt welded tubes
Auxiliary equipments for tube plants
Complete steel works





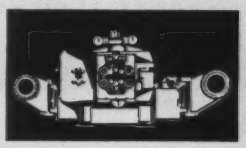


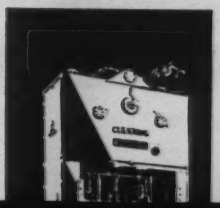




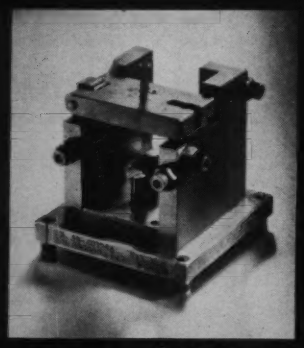
Machine-Tools

Large, high-powered milling and boring machines
Presses for hot and cold drawing.





Tooling with tape...



This drill jig: $280.00

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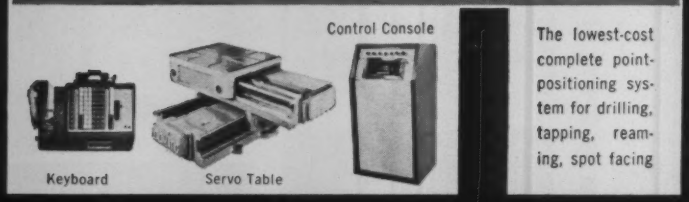

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PROGRAM

Fri., April 22—9:45 a.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

TECHTOUR "GUN DRILLING I"

Chairman—G. R. Squibb, Automotive Conversion Corp.

Gun Drilling in Production, by J. Savage, Chrysler Corp.

Pressure - Coolant Drills and Reamers for Precision Hole Production, by H. Gregg, Star Cutter Co.

Selection and Use of Cutting Fluids for Gun Drilling and Reaming, by R. F. Balow, Socony Mobil Oil Co., Inc.

Machine-Tool Considerations in Multiple Gun-Drilling and Gun-Boring Operations, by E. R. Delamater, Foote-Burt Co.

Fri., April 22—8:30 p.m.

Founders Room, Sheraton-Cadillac Hotel.

ORDNANCE TOOLING

Chairman—E. Makie, Curtiss-Wright Corp.

Ordnance Machine-Tooling Policies, by F. Wittber and J. F. Pauls, Ordnance Weapons Command.

Pilot Line Tooling of Small Arms Weapons at Springfield Armory, by T. J. Brusnicki and A. R. Brus, Springfield Armory.

Fri., April 22—8:30 p.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

TECHTOUR "GUN DRILLING II"

Chairman—G. R. Squibb, Automotive Conversion Corp.

Panel Participants—J. Savage, Chrysler Corp.; G. Johnston and H. Gregg, Star Cutter Co.; R. F. Balow, Socony Mobil Oil Co., Inc.; E. R. Delamater, Foote-Burt Co.

Sat., April 23—9:15 a.m.

Founders Room, Sheraton-Cadillac Hotel

STANDARDIZATION AND MACHINE DESIGN

Chairman—C. J. Oxford, Jr.,

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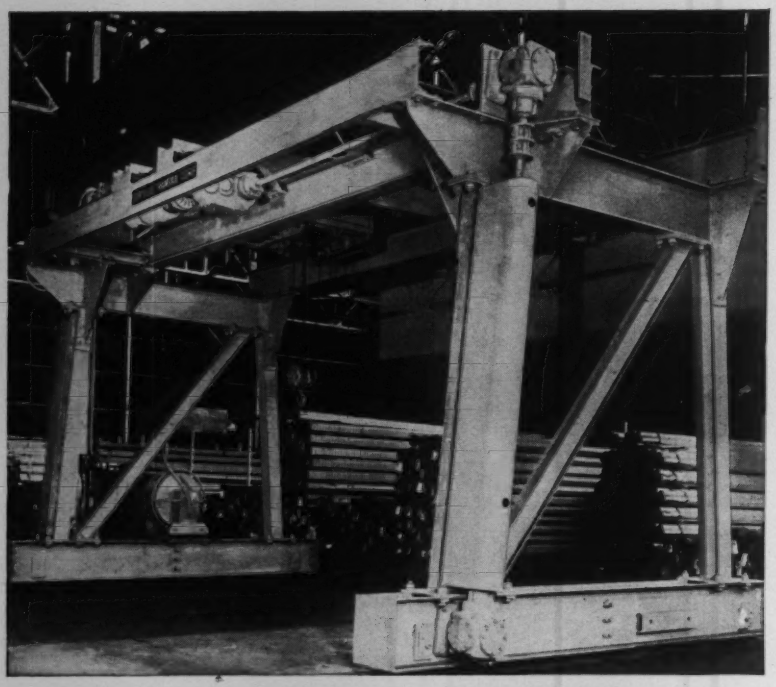

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PROGRAM

National Twist Drill & Tool Co.

Standardization of Processes, Tooling, and Tool Components as Applied to Eclipse-Pioneer, by D. French, Eclipse-Pioneer Div., Bendix Aviation Corp.

On the Efficiency of Machine-Tool Suspension, by Dr. M. Sadowy, Marquette University, College of Engineering.

Sat., April 23—10:00 a.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

ENGINEERING ENROLLMENTS

Chairman—C. L. Fanning, General Motors Institute.

Some Significant Aspects of Current Engineering Enrollments, by W. T. Alexander, Northeastern University.

Trends in Engineering Enrollments, by L. K. Wheelock, Engineers Joint Council.

Sat., April 23—2:30 p.m.

Founders Room, Sheraton-Cadillac Hotel

ENGINEERING CURRICULUM

Chairman—A. F. Gould, Lehigh University.

Engineering Education for the Future, by Dr. W. L. Everitt, University of Illinois, College of Engineering.

Tool Engineering—Our Place in Education, by F. Preator, Utah State University.

Sat., April 23—2:45 p.m.

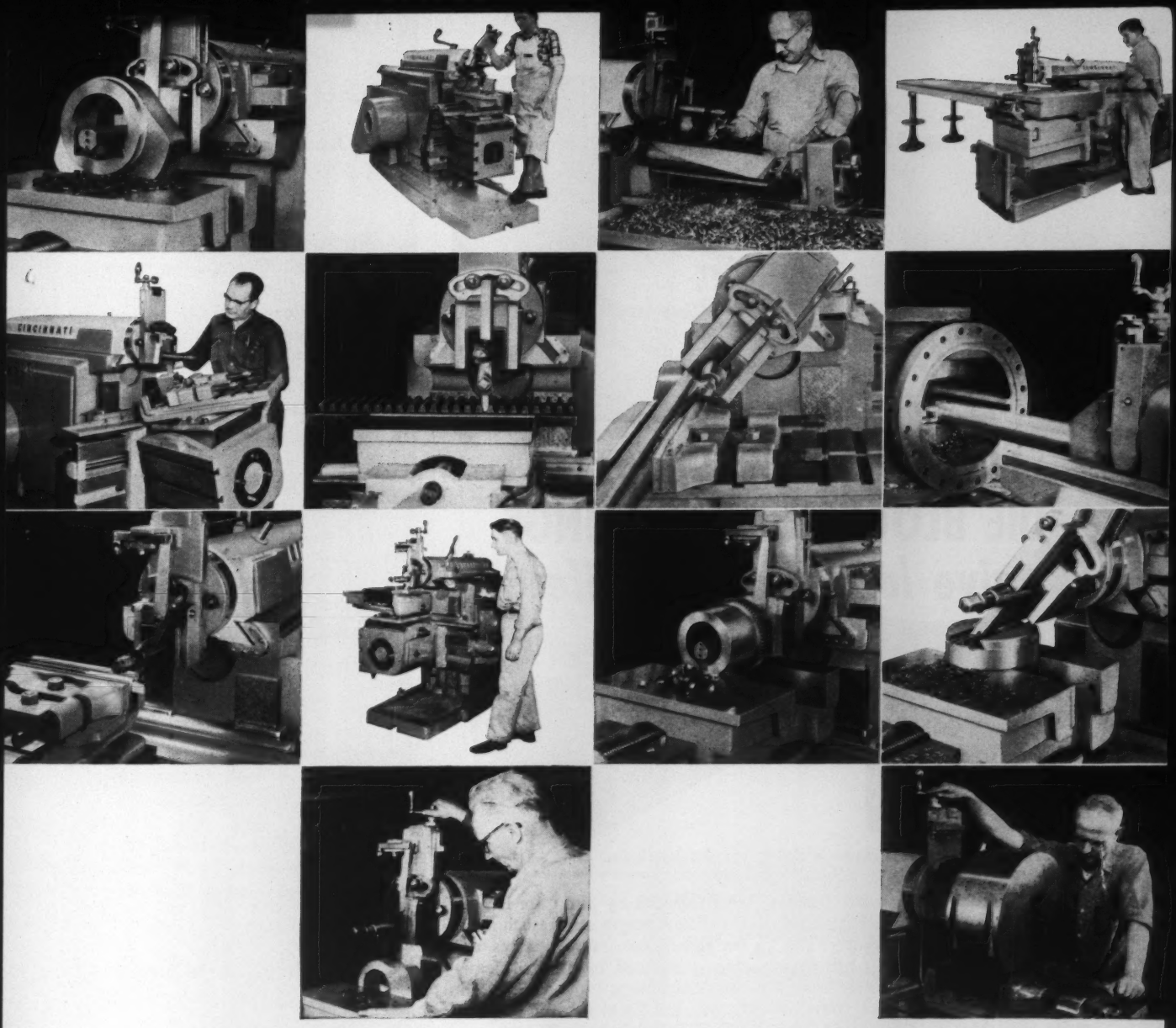
Crystal Ballroom, Sheraton-Cadillac Hotel

IMPROVEMENTS SPARKED BY RESEARCH

Chairman — R. T. Thornton, Ford Motor Co.

A Tool Dynamometer for Electrolytic Grinding Research, by Prof. R. R. Cole and R. A. Needham. University of California.

Improving Welding Techniques in a Medium-Sized Plant, by J. L. Aldred, Sherman Products, Inc.



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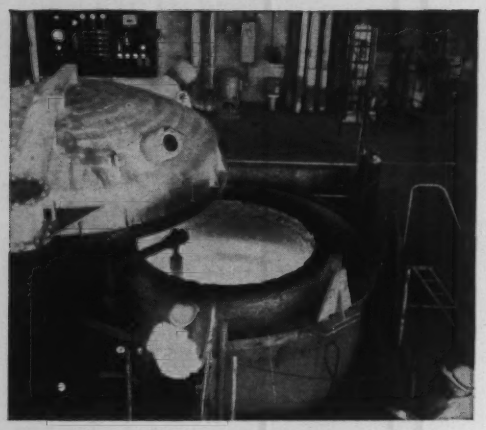

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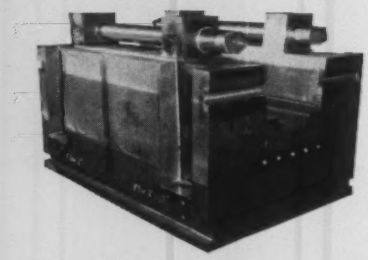

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PROGRAM

Mon., April 25—9:15 a.m.

Grand Ballroom, Sheraton-Cadillac Hotel

VALUE ANALYSIS I

Chairman—A. Underwood, Jr., Windsor Mfg. Operations, Ford Motor Co. of Canada.

The Tool Engineer's Role in Effective Product Planning, by C. Farnworth, Chrysler Corp.

Mon., April 25—9:30 a.m.

Crystal Ballroom Sheraton-Cadillac Hotel

COMMUNICATIONS

Chairman—C. S. Abbott, J. N. Fauver Co., Inc.

The Impossibility of Communication, by P. M. Beatts, IBM Corp.

Mon., April 25—9:45 a.m.

Founders Room, Sheraton-Cadillac Hotel

METAL CUTTING I

Chairman — H. J. Siekmann, General Electric Co.

Machining of Steel Casting Surfaces, by F. L. Brugger, Kennametal Inc.

Milling Zircaloy—Recommendations from Research, by W. Pentland, The Cincinnati Milling Machine Co.

Mon., April 25—2:30 p.m.

Founders Room, Sheraton-Cadillac Hotel

VALUE ANALYSIS II

Chairman—J. J. VanMaele, Allied Engineering Co.

Operational Product Analysis and Cost Estimating, by W. L. Shepherd, Chrysler Corp.

Mon., April 25—2:45 p.m.

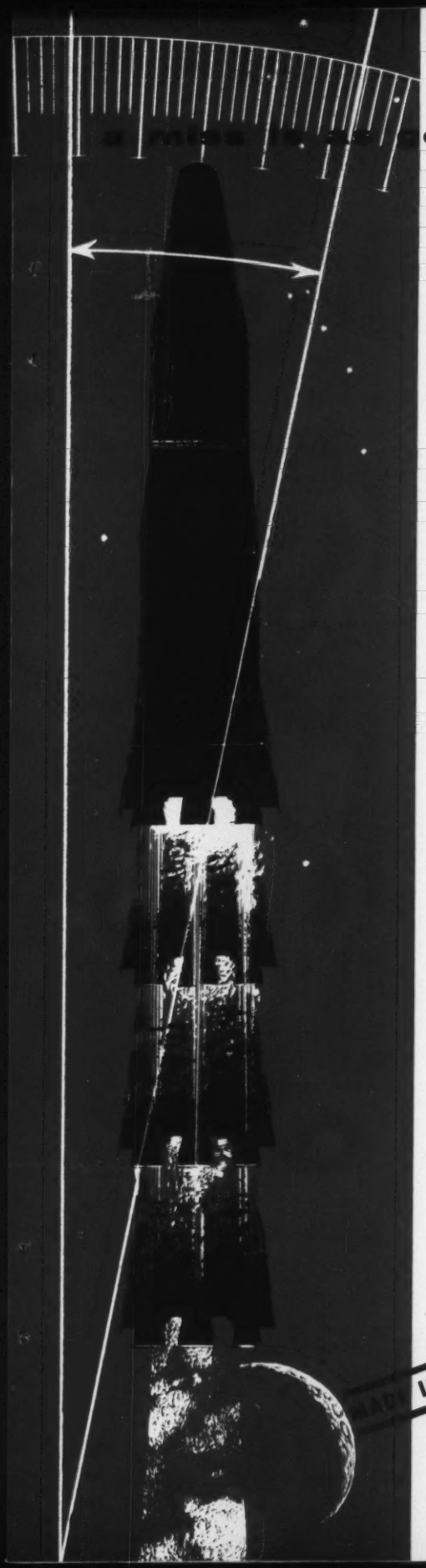
Crystal Ballroom, Sheraton-Cadillac Hotel

ASME EXCHANGE PAPERS

Chairman—R. E. McKee, R. K. LeBlond Machine Tool Co.

Engineering Application of Digital Computers, by H. D. Irwin, E. I. du Pont de Nemours & Co., Inc.

New Developments in the Theory of the Metal-Cutting Process: The



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MILL PRODUCTS

PROGRAM

Ploughing Process in Metal Cutting, by P. Albrecht, The Cincinnati Milling Machine Co.

Mon., April 25—7:30 p.m.

Crystal Ballroom, Sheraton-Cadillac Hotel
RADIATION AND THE TOOL ENGINEER

Chairman—H. N. Bogart, Ford Motor Co.

The Proposed Use of Radioisotopes for Die-Life Tests, by D. Peckner, MATERIALS IN DESIGN ENGINEERING.

Sonic Energy as a Production Tool, by Dr. T. J. Bulat, Bendix Aviation Corp., Pioneer—Central Div.

Mon., April 25—7:45 p.m.

Founders Room, Sheraton-Cadillac Hotel
METAL CUTTING II

Chairman — W. Blackmun, Thompson Ramo Wooldridge, Inc.

Production Application of Ceramics to the Machining of High-Strength Steels, by J. W. Rodd and D. T. Bisceglia, Watervliet Arsenal.

Precision Forming Techniques—Cold Swaging, by P. A. G. Carbonaro and S. Valencia, Rodman Laboratory, Watertown Arsenal.

Tues., April 26—9:15 a.m.

Crystal Ballroom, Sheraton-Cadillac Hotel
SYMPOSIUM I

Chairman—L. P. Gajda, Snyder Corp.

Introduction to Automation—Numerical Control, by J. C. Keebler, AUTOMATION magazine.

Areas in Which Automation is Useful, by W. C. Goeckel, Snyder Corp.

A Hole in the Tape is Worth Two in the Head, by W. E. Brainard, Servo Machine Tool Div., Kearney & Trecker Corp.

Tues., April 26—9:30 a.m.

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HIGH ENERGY FORMING

Chairman—L. G. Briggs, Man-

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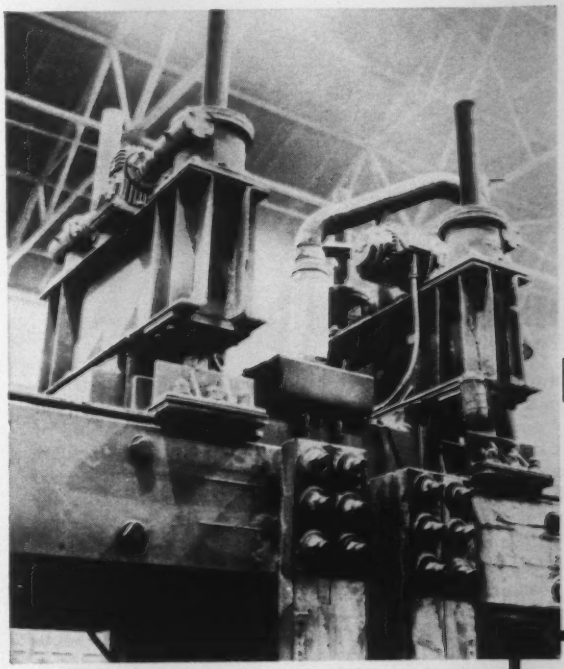

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Why Form Explosively?, by D. C. Harleman, Wright - Patterson Air Force Base, and A. F. Watts, Lockheed Aircraft Corp.

A Critical Review of High-Energy Forming Methods, by W. W. Wood, Chance Vought Aircraft Inc.

Tues., April 26—2:30 p.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

SYMPOSIUM II

Chairman — H. R. Bentley, Chrysler Corp.

Field Experiences With Automation, by R. B. Read, The Cross Co.

Numerical Controls — How We Use Them, by C. E. Chapman, General Electric Co.

What is the Future of Automation and Numerical Control, by C. F. Stugard, Cincinnati Milling & Grinding Machines, Inc.

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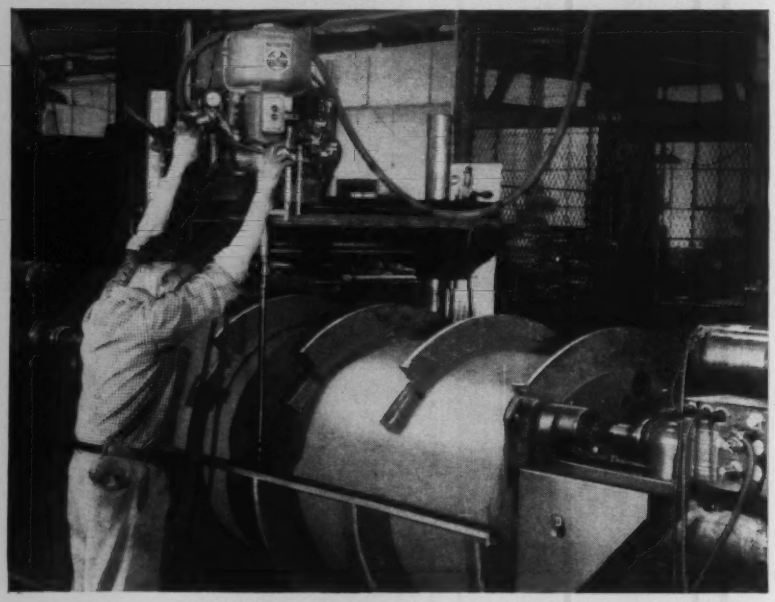

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Tues., April 26—2:45 p.m.

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METAL CUTTING III

Chairman—C. F. Brigner, Jr., Valenite Metals Div., The Valeron Corp.

Recent Developments in Ultra High-Speed Machining, by R. L. Vaughn, Lockheed Aircraft Corp., and R. T. Krueck, Wright-Patterson Air Force Base.

The Effect of New Developments in Metalworking on the Producibility of High-Temperature Metals, by R. H. Patchen, Aerojet-General Corp.

Tues., April 26—7:30 p.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

SYMPOSIUM III

Individual conferences will be held with all speakers listed for Symposiums I and II.

Tues., April 26—7:45 p.m.

Founders Room, Sheraton-Cadillac Hotel

PRODUCTION PROGRAMMING

Chairman—W. M. Edward, Ford Motor Co.

A New Approach to Production Control, by F. C. Janke, Hancock Industries Inc.

Built-In Production Programming Saves Money, by M. Zajac, Buhr Machine Tool Co.

Wed., April 27—9:15 a.m.

Founders Room, Sheraton-Cadillac Hotel

METAL CUTTING IV

Chairman — J. Ketchman, Ford Motor Co.

Milling High - Strength Thermal-Resistant Alloys, by N. Zlatin, Metcut Research Assoc. Inc., and R. T. Krueck, Wright-Patterson Air Force Base.

Drilling Very High-Strength and Thermal-Resistant Metals, by R. G. Kennedy, R. Johnson, N. Marrotte, and E. Brezina, The Cleveland Twist Drill Co.

Wed., April 27—9:30 a.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

HEAT AND THE TOOL ENGINEER

Chairman—W. E. Benninghoff, Industrial Heating Equipment Assn., and Tocco Div., Ohio Crankshaft Co.

Controlled Furnace Atmospheres Improve Performance of Cutting Tools and Dies, by R. F. Novy, Lindberg Engineering Co.

Principle and Characteristics of Salt-Bath Furnaces, by L. B. Rosseau, Ajax Electric Co.

Wed., April 27—2:00 p.m.

Founders Room, Sheraton-Cadillac Hotel

TRACER CONTROL

Chairman—D. A. Cargill, Cargill Detroit Corp.

Numerical Control Versus Tracer Control of Machine Tools, by L. M. Cross, True-Trace Corp.

Applications of Numerical Control Proven in Practice, R. A. Sitts, General Electric Co.

Wed., April 27—2:15 p.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

NEW PROCESSES

Chairman — J. H. Challoner, Chrysler Corp. of Canada.

Plasma-Arc Speeds Many Metalworking Processes, by J. A. Browning, Thermal Dynamics Corp.

Machining and Welding with Electron Beam, by K. H. Steigerwald, Carl Zeiss Co., and Electrona, Inc.

Thurs., April 28—9:15 a.m.

Founders Room, Sheraton-Cadillac Hotel

METAL CUTTING V

Chairman — B. A. Wharram, Chevrolet Motor Div., General Motors Corp.

Cost Saving Through the Use of Throwaway Tooling — The VBU System, by J. W. Heinmiller, Chrysler Corp.

New Developments in Throwaway Boring-Tool Application, by W. Yogus, The Valeron Corp.

Thurs., April 28—9:30 a.m.

Crystal Ballroom, Sheraton-Cadillac Hotel

CONTROL VALVES

Chairman—F. L. Mackin, General Motors Institute.

In-Plant Application of Air Controls, by W. D. Ludwig, Mechanical Air Controls Inc.

Using New Signal Sources for Hydraulic-Control Valves, by J. J. Pippenger, Double A Products Co.

Thurs., April 28—2:00 p.m.

Founders Room, Sheraton-Cadillac Hotel

METAL CUTTING VI

Chairman—W. C. Killen, Pontiac Motor Div., General Motors Corp.

Milling with Throwaway Inserts, by A. S. Rogers, Wesson Co.

User's Viewpoint on Throwaway-Tip Milling Cutters, by C. P. Farr, Massey-Ferguson Ltd.

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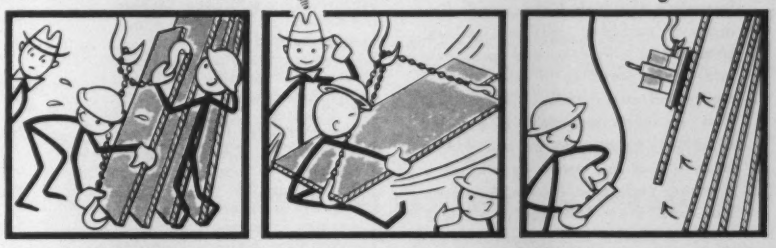

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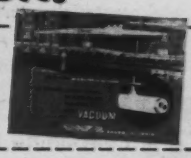

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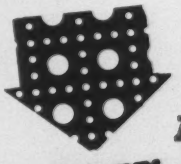

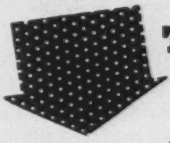

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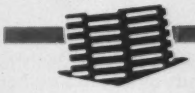

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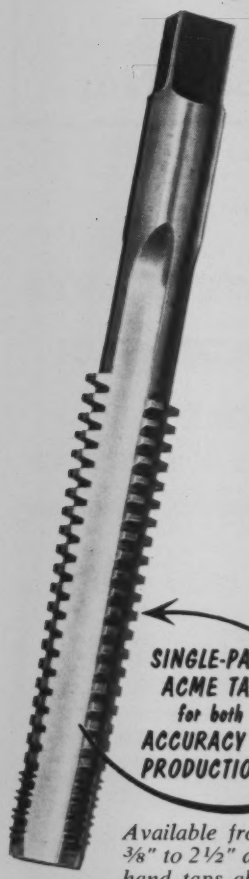
Hudson Automatic Machine & T'l	2265
Hughes Aircraft-Ind'l Systems	2117
Hunt Valve Co.	301
Huron Machine Products, Inc.	938
The Hy-Du-Lignum Co.	1367
Hypneumat, Inc.	1639
Hydroway Scales, Inc.	2123
Hyprez Div., Engis Equip't	1465
I. S. I. Mfg., Inc.	2051
Ideal Industries, Inc.	445
Index Machine Co.	1427
The Indi-Square Co.	465
Industrial Diamond Assn.	430
Industrial Tectonics, Inc.	835
Ingersoll Milling Machine	1708
Ingersoll-Rand Co.	1026
International Machine Tool	314
The Iron Age	850
ISIS, Inc.	160
J & S Tool Co.	2116
Jarvis Corp.	131
Jarvis-Carbide Subsidiary	1667
Jiffy Disintegrators, Inc.	2214
Jiffy Mfg. Co.	745
C. E. Johansson Gage Co.	330
The I. O. Johansson Co.	1435
The Johnson Gage Co.	331
Jones & Lamson Machine Co.	1208, 1217
Junior Engineering Technical Society	1967
Kalamazoo Tank & Silo Co.	300
Karniotis Prec. Products	843
Kennametal, Inc.	1004
Al Klingelhofer Machine Tool	1860
Koebel Diamond Tool Co.	1623
Paul L. Kuzmick Co.	1825
Lahr Machine & Tool Corp.	1821
Lake Erie Machinery Corp.	910
Lapeer Mfg. Co.	726
Last Word Sales Co.	114
Latrobe Steel Co.	442
The Laurel Corp.	748
Le Count Tool Works	469
K. O. Lee Co.	1431
Leland-Gifford Co.	767
Lennox Tool & Machine	846
Lincoln Industries Co.	2030
Link Div. Gen'l Precision	2055
F. J. Littell Machine Co.	505
Littleford Bros., Inc.	747
Livernois Engineering Co.	905
John E. Livingstone Co.	109
Lodding, Inc.	2047
Logan Engineering Co.	1830
Logansport Machine Co.	1815
Lovejoy Tool Co.	334
Lowell Industries	1616
The Lufkin Rule Co.	730

Ernie's the wonder boy since he's using our

ACME TAPS!



Ernie's job with a large Cincinnati firm was like any other young machinist's—until we surprised his boss by delivering one tap instead of a set of two!

Their order: A set of rough and finish Acme taps to produce a 2⅛" diameter, 4 pitch, double left hand thread in a part made of Johnson bronze. Length of thread 7", with a close concentricity between thread and major part.

Our long experience in producing Acme taps suggested that this job *might* be done with a *single-pass* tap. We experimented—and came up with a tap that amazed the whole shop.

Now, instead of the skilled mechanic needed for multiple stage taps, less experienced fellows like Ernie are producing the same parts in half the time. Better quality, too. And no broken finishing taps or loss of other parts.

With production costs down and high-priced personnel released for more productive assignments, this company now stands in a better competitive position.

We've been in this business for over 20 years and will be glad to help you, too. Send for our brochure.

SINGLE-PASS ACME TAP for both ACCURACY & PRODUCTION

- SHOP-TESTED (12 years)
- CUSTOMER ACCEPTED (4 years)
- FIRST CHOICE OF LEADING LATHE, VALVE AND MACHINE TOOL MANUFACTURERS

Available from factory stock! Single-pass Acme Taps from ⅜" to 2½" diameter. Many special pitch, double start and left hand taps also available. Fast delivery on specials. Send us your prints for estimating.

H&R The Tapmaking Specialists — **HORSPOOL & ROMINE** 5850 Marshall Street Oakland 8, California

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M. B. I. Export & Import	1505
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Madison Industries, Inc.	1826
Magnaflux Corp.	326
Mahr Gage Co.	130
Marac Machinery Corp.	1919
Martin Engineering Co.	746
Martindale Electric Co.	856
Master Chemical Corp.	754
Master Power Corp.	2008
Matson Co., Inc.	1545
Jas. H. Matthews & Co.	627
Maxwell Industries, Inc.	1661
Mayes Tool Co.	568
Mayline Company, Inc.	426
McCrosky Tool Corp.	931
Mead Specialties Co.	951
Meier Brass & Aluminum	2020
Metal Carbides Corp.	2060
Metal Cutting Tools, Inc.	1644
Metallurgical Products, G. E.	1227
Michigan Manufacturers Service	1421
Micromatic Hone Corp.	1816
Micrometrical Mfg. Co.	305
Micro-Poise Engineering	615
Ty Miles, Inc.	1756
M & M Tool & Mfg	1265
Modern Industrial Engineering	1818
Moffatt Products, Inc.	1108
Mohawk Tools, Inc.	327
Monroe Engineering Products	2021
Montgomery Tool Co.	2012
Moore Products Co.	124
Moore Special Tool Co.	1105
Morrison Engineering Co.	1543
H. E. Morse Co.	561
Munn Engineering Co.	1548
Muskegon Tool Industries	921
The National Acme Co.	1939
National Broach & Machine	814
National Tool & Die Manufacturers Assoc.	2015
James Neill & Co. (USA) Ltd.	2219
Karl A. Neise	1561
Newage Industries, Inc.	2240
New Departure Div. GMC	1739
New England Machine & T'l	2061
New Hermes Engrav. Machine	1555
Newton Hydraulic Tooling	1627
Nicholson File Co.	965
Nikon, Inc.	607
Nixon Steel Co.	840
Noble & Westbrook Mfg.	1446
Nobur Mfg. Co.	2235
C. A. Norgren Co.	720
N. American Viking Drill	1716
Northwestern Tools, Inc.	2218
Nupla Mfg. Co.	913
The O. K. Tool Co.	567
Oakite Products, Inc.	930
The Ohio Crankshaft Co.	1017
Olivetti Corp. of America	1660
Tinius Olsen Testing Mach.	2050
O'Neil-Irwin Mfg. Co.	805
Optical Gaging Products	830
Ortman-Miller Machine Co.	1808
The Osborn Mfg. Co.	1305
Pangborn Corp.	2231
Park Chemical Co.	1655
Parker-Hannifin Corp.	1915
Parker-Kalon Corp.	1542
Payne Tool and Engineering	1567
Perkins Machine Co.	2265
PIC Design Corp.	742
Pines Engineering Co.	1839
Pioneer Eng'g & Mfg.	1443
Pivot Punch & Die Corp.	2026
Plan Hold Corp.	848
Portage Double Quick, Inc.	2226
H. K. Porter, Inc.	749
Porter Precision Products	942
Portomag, Inc.	1642
Powermatic Machine Co.	2034
Precise Products Corp.	127
Precision Detroit Co.	661
Precision Tool & Mfg.	1539
Preferred Industries, Inc.	751
Presin Co.	2053
Press Automation Systems	1720
Procunier Safety Chuck	1714
Production Machine Co.	1922
The Producto Machine Co.	1144
Products Supply Co.	2149
Pull-Gear Co.	2225
Punch Products Corp.	1742
Putnam Tool Co.	150
RCA Industrial Automation Div.	1961
Rahn Granite Surface Plate	242
Reli-A-Check Corp.	1648
Reliance Machine Products	345
Reliant Gage & Supply	1549
REM Sales, Inc.	604
Ren Plastics, Inc.	1517
Rice Pump & Machine	839
Richard Bros. Punch Div.	1814
J. A. Richards Co.	1061
Rockwell Mfg.-Delta Power	2046
Rockwell Mfg.-Walker Turner	2236
Ross Operating Valve Co.	1255
The Rotor Tool Co.	1938
Rotherm Engineering Co.	1645
Rowe Machinery & Mfg.	761
Royal Oak Tool and Machine	560
The S-P Mfg. Corp.	1516
S & S Machinery Co.	2031
Sales Service Mach. T'l	531
Salvo Tool & Engineering	2045
Sandvik Steel, Inc.	227
Scharmann Machine Corp.	1914
Schauer Mfg. Corp.	838
Scherr-Tumico Co.	1330
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A. Schrader's Son	1751

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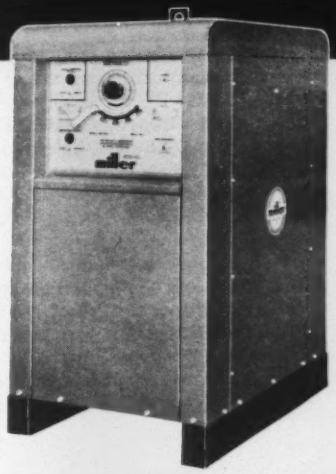

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• A bold new concept in electrical design and circuitry is introduced in the all-new Miller BWC-300MAP. One of several notable results is complete and automatic elimination of the d-c component at all welding currents . . . an essential in certain critical welding applications.

• Due to the specially designed transformer, high arc initiation voltage and unique circuit, arc-outages cannot occur.

• "Fail-safe" voltage reducer automatically lowers the high arc initiation voltage to a low open circuit voltage — even in case of malfunction of the reducer.

• Five independent welding ranges with overlap offer an infinite number of positive, fine current settings — another characteristic of Miller's electrical control that speeds up and simplifies critical welding jobs.

EXCLUSIVES! — found only in new Miller BWC-300MAP:

1. **Perfect balance throughout the entire welding range EVEN DURING CRATER ELIMINATION.**
2. **Arc stability WITHOUT HIGH FREQUENCY at as low as 18 amperes.**

The outstanding versatility of this welder, and the specifics on its various features, are detailed fully on our form #BW-3 — a copy of which will be sent to you promptly upon request.

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Service Machine Co.	1722
Severance Tool Industries, Inc.	320
The Sheffield Corp.	405, 500
Sheldon Machine Co., Inc.	1727
Stanley Sheppard	1842
Sieburg Industries, Inc.	2121
Siewek Tool Co.	667
Sigma Machinery	1315
Simonds Abrasive Co.	631
Simonds Saw & Steel	631
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Spiral Carbide Tool Co.	1654
Spiral Step Tool	1442
Spitfire Tool and Machine	552
Stacor Equipment Co.	638
Standard Electrical Tool Co.	1430
Standard Parts Co.	966
Standard Pressed Steel Co.	515
Standard Tool & Mfg.	1838
Stanley Electric Tools	2115
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Starlite Industries, Inc.	1866
The L. S. Starrett Co.	600
Speedline	1766
The Steco Corp.	2023
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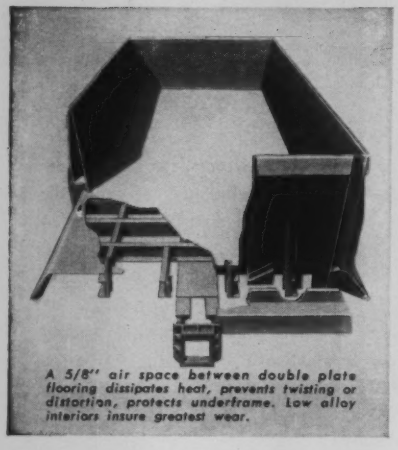
Stewart-Warner Corp.	1535
Edwin B. Stimpson Co., Inc.	530
Storch Products Co., Inc.	1865
Stromberg-Carlson	2024
Stupalox-The Carborundum Co.	416
Sunnen Products Co.	1155
Superior Hone Corp.	1960
Superior Steel Products Corp.	1439
Supreme Products Corp.	917
Swanson-Erie Corp.	146
Sykes Machine & Gear Corp.	115
Sylvania Lighting Products	1615
Taylor-Winfield Corp.	1409
Texaco, Inc.	960
Earl A. Thompson Mfg. Co.	1060
Thomson Industries, Inc.	1550
Thor Power Tool Co.	1948
Thread-All Sales Co.	2114
Threadwell Tap and Die	2154
Thriftmaster Prod. Corp.	1550
The Timkins-Johnson Co.	1327
The Tool Engineer, ASTME	1965
Torit Mfg. Co.	736
Trabon Engineering Corp.	939
Tracer Control Co.	2220
True-Trace Sales Corp.	1831
The U. S.-Burke Machine T'l Co.	1909
U. S. Tool Company, Inc.	1520
Uddeholm Co. of America	548
Union Mfg. Co.	961
Union Twist Drill Co.	1927
United States Gypsum Co.	1451
Universal-Automatic Corp.	1761
Universal Engineering Co.	614
Univertical Foundry & Machine	365
Upton Bradeen & James, Inc.	161
V. D. F. Div. Rudel Machinery	139
Valenite Metals	1209
Vanadium-Alloys Steel Co.	431
The Van Keuren Co.	415
Vapor Blast Mfg. Co.	354
Vascoloy-Ramet Corp.	1030
V-B Mfg. Co.	224
Veet Industries	904
Vernon Devices, Inc.	946
Vidmar, Inc.	547
The Viking Tool Co., Inc.	343
Vinco Corp.	865
Vlier Engineering Corp.	1426
Vulcan Tool Co.	1254
Waldes Kohinoor, Inc.	1861
Wales Strippit, Inc.	1221
O. S. Walker Co., Inc.	2242
Walmet Corp.	2120
Warner & Swasey Research Corp.	1635
Watts Regulator Co.	2042
Webber Gage Co.	240
Wedin Corp.	2223
The Weldon Tool Co.	439
Wells Mfg. Corp.	1551
Wespo Div., Vlier Engineering Corp.	1317
Wheelabrator Corp.	861
Wheel Trueing Tool Co.	338
S. B. Whistler & Sons, Inc.	1339
The Whiton Machine Co.	1434
The Wickman Mfg. Co.	1139
C. C. Wilde Co.	641
Wilson-Carr, Inc.	655
Wilson Mechanical Instrument Div.	715
Thomas C. Wilson, Inc.	1657
Wilton Tool Mfg. Co.	1754
Winslow Product Engineering Corp.	1165
Wintriss, Inc.	844
Wisconsin Drill Head Co.	621
Wolverine Tool Co.	2043
N. A. Woodworth Co.	1351
Zagar, Inc.	351, 718, 1653
Carl Zeiss, Inc.	1538
The Zero-Max Co.	1447
W. M. Ziegler Tool Co.	1855
Ziv Steel & Wire Co.	2137

MAGOR AIR DUMP CARS

FOR STEEL PLANT SERVICE

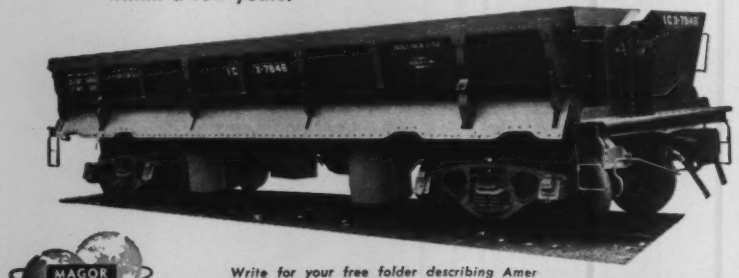


A 5/8" air space between double plate flooring dissipates heat, prevents twisting or distortion, protects underframe. Low alloy interiors insure greatest wear.

The new Magor Air Dump Car for steel plant service can cut your refuse disposal costs as much as 40%! Safe, swift, automatic dumping eliminates expensive labor and crane equipment. Low height and open type body means faster loading. Saves time, labor and haulage costs! Smooth interiors eliminate "dead load" returns!

The double-plate flooring shown here is just one of the many Magor design features that account for Magor's leadership in dump car production. Designed for the job — built to last, Magor Air Dump Cars cost less to buy — less to operate!

Savings effected by the new Magor Air Dump Cars will write off your entire dump car investment within a few years.



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MAGOR CAR CORPORATION

50 Church Street
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The Iron Age Summary

Market "Correction" Continues

Rate of new orders picks up in some markets but remains disappointing.

The market is still feeling the effects of first quarter all-out production and backlogs of orders on the books.

■ The rate of new steel orders continues to lag behind steel consumption. And it will continue to do so for possibly six more weeks.

The current period of "correction" is caused by a combination of the almost fantastic 35 million tons of steel produced in first quarter 1960 and backlogs still existing on mill order books.

Some Improvement — Until the backlogs are worked off, steel orders will not actively reflect the market picture.

Mills this week report a mild improvement in new orders. But they are still disappointing when measured against capacity. While most steel executives are confident of a pickup in orders soon, the steel operating rate will continue to decline, probably into the 70's (percent of capacity) before leveling off.

Positive Factors—On the positive side, these developments are noted this week: Cancellations and deferments of steel orders already placed have leveled off and in some areas have almost ceased.

The big users of steel have their inventories at the point where they want them and any surge of new business will mean an upsurge in new orders.

Release of pipeline projects by the government have resulted in new orders and shipments for linepipe, with more major projects due to break in the next few months. As a result, linepipe is the strongest tubular product.

After the end of May, steel business will reflect closely the rate of business done by steel users. For this reason, barometers like auto sales, appliance sales, and construction indicators are getting the closest scrutiny.

Automotive Question—Big concern remains the 1 million plus stocks of unsold automobiles. Auto production schedules for April are erratic and vary from week to week. Two weeks ago, automakers were programming 600,000 units for the month. Today, they are planning 585,000. This compares with 579,000 for April of 1959.

Some hope for more automotive business came last week when major orders were placed for late May. At least two major General Motors divisions were involved.

Rate Drops—Operating rates declined generally throughout most districts. A strike at Great Lakes Steel added to the lower rate. As a result, the national operating rate dropped to 79.9 pct of capacity this week. This is the lowest since November, 1959.

Price weakness continues in some steel warehouses. Service center price cuts in the Southwest in the last two weeks range from 38¢ to as high as 65¢ per cwt. The cuts were mainly through readjustments in quantity extras. Warehousemen elsewhere say prices are stable, but the warehouse business is competitive and some competitive pricing is the inevitable result.

Steel Output, Operating Rates

Production	This Week	Last Week	Month Ago	Year Ago
(Net tons, 000 omitted)	2,277	2,417	2,607	2,657
Ingot Index				
(1947-1949=100)	141.7	150.5	162.3	165.4
Operating Rates				
North East Coast	79.0	86.0	87.0	97.0
Buffalo	87.0	91.0	103.0	98.0
Pittsburgh	82.0	81.0	94.0	96.0
Youngstown	65.0	74.0	86.0	89.0
Cleveland	92.0	93.0	100.0	97.0
Detroit	52.0	90.0	100.0	100.0
Chicago	88.0	92.0	96.0	94.0
Cincinnati	99.0	102.0	98.0	86.0
St. Louis	99.0	103.0	86.0	104.0
South	82.0	80.0	87.0	92.0
West	75.0	71.0	80.0	93.0
U. S. Rate	79.9	84.5	91.5	93.8

*Revised
Source: American Iron And Steel Institute

Prices At a Glance

(Cents per lb unless otherwise noted)

	This Week	Week Ago	Month Ago	Year Ago
Composite price				
Finished Steel, base	6.196	6.196	6.196	6.196
Pig Iron (Gross ton)	$66.41	$66.41	$66.41	$66.41
Scrap No. 1 hvy (Gross ton)	$33.50	$33.17	$33.50	$35.17
No. 2 bundles	$23.00	$22.50	$22.33	$23.17
Nonferrous				
Aluminum ingot	28.10	28.10	28.10	26.80
Copper, electrolytic	33.00	33.00	33.00	31.50
Lead, St. Louis	11.80	11.80	11.80	10.80
Magnesium	36.00	36.00	36.00	36.00
Nickel, electrolytic	74.00	74.00	74.00	74.00
Tin, Straits, N. Y.	99.375	99.625	100.625	102.25
Zinc, E. St. Louis	13.00	13.00	13.00	11.00

Plating Equipment Sales Climb

Plating equipment makers report business in 1960 is way ahead of the same period in 1959.

The market is far from slow and the good business trend is expected to continue. Automation is one of the big factors behind the sales increase.

■ The electroplating supplies and equipment business is looking good from just about all sides.

It is up notably from last year. Udylite Corp., Detroit, biggest in the field, notes that total sales of equipment and supplies in the first two months of the year easily topped the identical 1959 period.

New Record?—Consumable supplies, such as brighteners and anodes, are the hot items. These are not usually stockpiled, so sales indicate current consumption. These appear headed for a new record.

For example, sales of nickel to platers in the first two months of 1960 were 30 pct over the same period in 1959. Cadmium sales were up 50 pct in the same situation.

Udylite notes that while supplies were 75 pct of total sales in January and February 1959, they were 80 pct in the same months this year.

Extra Duty — The equipment market is far from slow. It's just that post-Korean installations were very high, slumping off to a low in 1958. Equipment installed in that period usually included extra capacity, some of which is just being used for the first time now. Sales are still running close to 30 pct over last year.

Automation is the big trend in equipment. One equipment maker says "nearly all equipment is now automatic." Why? It cuts handling costs which in many cases lets the smaller plater compete with larger shops.

Faster Work—Equipment makers say they are able to devise adapters and techniques to streamline present equipment. A case in point is found in the auto industry.

New specifications for chromium plated parts call for a double layer of nickel under the chromium. Udylite says it can adapt current equipment to automatically handle this double plating process.

Dealers Optimistic—On the outlook, equipment orders are currently very satisfactory, makers say. And the rate of inquiries indicates good sales are coming. Equipment makers also say the long range outlook is promising.

Blending with automated equipment to firm up the outlook for platers and consequently their suppliers is the development of better consumable supplies and the trend toward heavy plating.

Super 66—For example, Udylite says its new Super 66 brightener will provide a completely bright plate without buffing regardless of any irregular shape of the part.

The heavier coatings are giving better performance and interesting more new customers to try plating. Chief market where this is happening is automotive.

GETTING BETTER: Technical developments in electroplating are increasing process efficiency and improving the quality of coatings. Udylite's Zero Mist tablets, added to chromic acid baths, eliminate mist and spray rising from the bath and carrying off solution.

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When you need machine work or specially built machinery of any kind, you'll find Sun Ship qualified to do the job exactly to your specifications. We have machine tools of every size, and the facilities and skills born of long experience.

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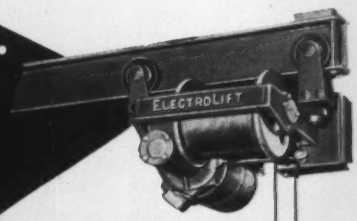

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WORM-DRIVE HOISTS

Dependable, long-lasting ElectroLift hoists are used by the thousands in America's largest manufacturing plants. Features of these units—ranging from ¼- to 10-ton capacity—include:

- **Worm-drive design for safe, sure braking action**
- **Use of quality components and materials for trouble-free performance**
- **Fully enclosed motor and gearing for clean, quiet operation**
- **Greater compactness for close headroom, safer action**

For details on speed, models and operation, consult your classified directory for the ElectroLift representative nearest you.

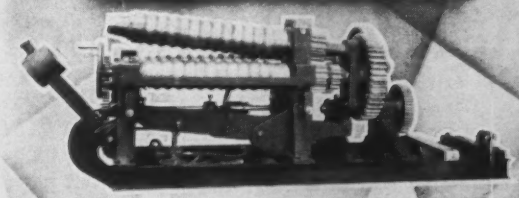
WORM DRIVE ELECTROLIFT HOISTS

6457

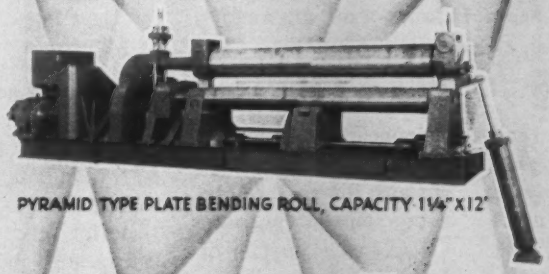
204 Sargeant Avenue **Clifton, N. J.**

SHEET METAL and PLATE-WORKING MACHINES

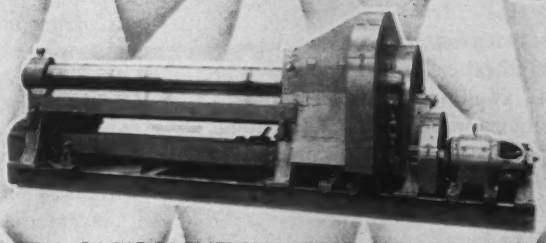
A complete line of heavy machinery for punching, shearing and bending sheet metal and heavy plates. . . .



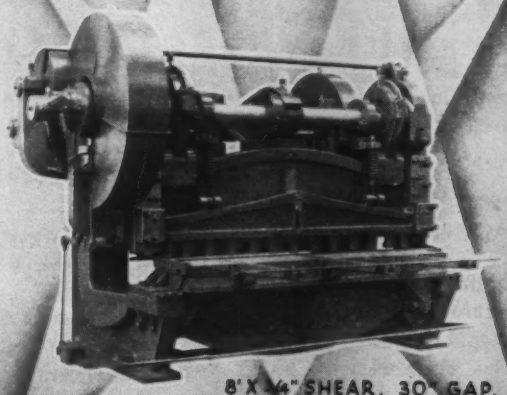
CORRUGATED CULVERT ROLL



PYRAMID TYPE PLATE BENDING ROLL, CAPACITY 1¼"X12'



INITIAL PINCH TYPE PLATE BENDING ROLL, CAPACITY ½"X8'



8'X¼" SHEAR, 30" GAP.

BERTSCH & COMPANY
CAMBRIDGE CITY INDIANA

Linepipe Enters Market Limelight

Producers of linepipe are getting ready to roll now that the government has OK'd several new pipeline projects.

Projects approved or awaiting clearance could take 1.5 million or more tons of steel.

▪ Linepipe producers have waited impatiently in recent months for the government to give the go-ahead to a number of new pipeline projects.

Mills say they have a logjam of linepipe orders on the books. Some estimates set the backlog and potential orders for linepipe for projects awaiting release at about 1.5 million tons or more. But producers have been told by customers to hold the orders until the projects are cleared.

The break came last week when several pipe producers reported the start-up of work on pipeline projects. Two mills say the orders will keep them going for 8 to 10 weeks. By then, they hope other projects will have cleared government hurdles so they can keep production going.

Reopen Mill — Republic Steel Co. has reopened the large diameter pipe mill at its Gadsden, Ala., plant and will add additional open-hearth furnaces to supply the pipe mill. Republic's order is from Midwest Gas Transmission Co. for its natural gas pipeline from Canada into Wisconsin. The Gadsden plant will produce 24-in. welded pipe for the Wisconsin segment.

National Tube Div. of U. S. Steel Corp. has already started shipping seamless pipe for its share of the country's newest major pipeline. A project of the Mid-America Pipeline Co., the 1750-mile pipeline will carry butane, propane, and natural gas liquids from New Mexico to Minnesota and Wisconsin.

Linepipe Limelight — Total cost of Mid-America's pipeline and storage facilities has been given as $71.6 million. It will take more than 100,000 tons of pipe, plus plate for seven terminal tanks.

One pipe producer says the outlook for linepipe is the brightest of tubular products as other major projects are expected to break during the next few months.

In sharp contrast, the outlook for oil country goods remains weak. Distributors are shifting the burden of inventories onto the mills. Downriver depots now offer overnight delivery, so jobbers are liquidating stocks.

Sheet and Strip — Adjustments are taking place on a regional basis. There are reports from **Detroit** that May prospects are shaping up a little better than expected. Several automotive divisions of one company placed large orders for delivery late in May. However, it isn't known if this means an increase in car scheduling will result, or that inventories are low. Salesmen believe there will be more larger-than-expected orders in the next two months. Sheet and strip inventories have been cut to the bone. Demand for sheet continues to drift downward in **Pittsburgh.** Cold-rolled sheet schedules, full for the current month, are expected to drop a little in May. A further drop is expected in June. The market for hot-rolled sheets is dropping faster.

Bars—Bar mills are probably closest of any steel facility to the point where new orders reflect actual consumption. The leveling out point for bars seems to be around 70 pct., according to a report from **Pittsburgh.** But orders will have to support this level. An increase may be coming from automotive buyers. Orders for alloy bars are coming in fairly strong for May. A salesman in **Detroit** notes alloy bar orders often forecast what's going to happen in the carbon bar market.

Stainless—Producers are moving to restore the 10 pct. discount on plates sold to warehouses. The warehouse discount was cut from 10 pct. to 5 pct. some time ago. Not all mills made the change, but most of the major producers installed the lower discount. Now, the 10 pct. is going back. While only one product is affected by the move, price cutting is not confined to plates or warehouse sales, according to reports from **Pittsburgh**. There have been no formal price reductions, but concessions are being made.

PURCHASING AGENT'S CHECKLIST

Export markets are not out of reach for U.S. firms, but it takes sales effort. P. 119

How to reduce costs in buying warehouse steel. P. 126

Getting more from numerical controls — an IRON AGE Special Feature. P. 149

Record February

February shipments of finished steel products set a new record for the month of 7.6 million tons, according to the American Iron and Steel Institute. The former record, set in 1956, was 7.5 million tons. During the same month a year ago, shipments totaled 6.5 million tons.

COMPARISON OF PRICES

(Effective April 12, 1960)

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Price changes from previous week are shown by an asterisk (*).

	Apr. 12 1960	Apr. 5 1960	Mar. 15 1960	Apr. 14 1959
Flat-Rolled Steel: (per pound)				
Hot-rolled sheets	5.10¢	5.10¢	5.10¢	5.10¢
Cold-rolled sheets	6.275	6.275	6.275	6.275
Galvanized sheets (10 ga.)	6.875	6.875	6.875	6.875
Hot-rolled strip	5.10	5.10	5.10	5.10
Cold-rolled strip	7.425	7.425	7.425	7.425
Plate	5.30	5.30	5.30	5.30
Plates, wrought iron	14.10	14.10	14.10	13.55
Stain'l's C-R strip (No. 302)	52.00	52.00	52.00	52.00
Tin and Terneplate: (per base box)				
Tinplate (1.50 lb.) cokes	$10.65	$10.65	$10.65	$10.65
Tin plates, electro (0.50 lb.)	9.35	9.35	9.35	9.35
Special coated mfg. ternes	9.90	9.90	9.90	9.90
Bars and Shapes: (per pound)				
Merchants bar	5.675¢	5.675¢	5.675¢	5.675¢
Cold finished bar	7.65	7.65	7.65	7.65
Alloy bar	6.725	6.725	6.725	6.725
Structural shapes	5.50	5.50	5.50	5.50
Stainless bars (No. 302)	46.75	46.75	46.75	45.00
Wrought iron bars	14.90	14.90	14.90	14.90
Wires: (per pound)				
Bright wire	8.00¢	8.00¢	8.00¢	8.00¢
Rails: (per 100 lb.)				
Heavy rails	$5.75	$5.75	$5.75	$5.75
Light rails	6.725	6.725	6.725	6.725
Semifinished Steel: (per net ton)				
Rerolling billets	$80.00	$80.00	$80.00	$80.00
Slabs, rerolling	80.00	80.00	80.00	80.00
Forging billets	99.50	99.50	99.50	99.50
Alloys, blooms, billets, slabs	119.00	119.00	119.00	119.00
Wire Rods and Skelp: (per pound)				
Wire rods	6.40¢	6.40¢	6.40¢	6.40¢
Skelp	5.05	5.05	5.05	5.05
Finished Steel Composite: (per pound)				
Base price	6.196¢	6.196¢	6.196¢	6.196¢

	April 12 1960	Apr. 5 1960	Mar. 15 1960	April 14 1959
Pig Iron: (per gross ton)				
Foundry, del'd Phila.	$70.57	$70.57	$70.57	$70.57
Foundry, Southern Cin'ti	73.87	73.87	73.87	73.87
Foundry, Birmingham	62.50	62.50	62.50	62.50
Foundry, Chicago	66.50	66.50	66.50	66.50
Basic, del'd Philadelphia	70.07	70.07	70.07	70.07
Basic, Valley furnace	66.00	66.00	66.00	66.00
Malleable, Chicago	66.50	66.50	66.50	66.50
Malleable, Valley	66.50	66.50	66.50	66.50
Ferromanganese, 74-76 pct Mn, cents per lb‡	11.00	11.00	11.00	12.25
Pig Iron Composite: (per gross ton)				
Pig iron	$66.41	$66.41	$66.41	$66.41
Scrap: (per gross ton)				
No. 1 steel, Pittsburgh	$34.50	$34.50	$34.50	$38.50
No. 1 steel, Phila. area	34.50	34.50	35.50	33.50
No. 1 steel, Chicago	31.50*	30.50	30.50	33.50
No. 1 bundles, Detroit	30.50	30.50	30.50	32.50
Low phos., Youngstown	36.50	38.50	37.50	40.50
No. 1 mach'y cast, Pittsburgh	51.50	51.50**	52.50	49.50
No. 1 mach'y cast, Phila.	51.50	51.50	51.50	49.50
No. 1 mach'y cast, Chicago	52.50	52.50	51.50	53.50
Steel Scrap Composite: (per gross ton)				
No. 1 hvy. melting scrap	$33.50*	$33.17	$33.50	$35.17
No. 2 bundles	23.00*	22.50	22.33	23.17
Coke: Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.75-15.50	$14.75-15.50	$14.75-15.50	$14.50-15.50
Foundry coke, prompt	18.50	18.50	18.50	18.50
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electrolytic, Conn.	33.00	33.00	33.00	31.50
Copper, Lake, Conn.	33.00	33.00	33.00	31.50
Tin, Straits, N. Y.	99.375*	99.625	100.25	102.25
Zinc, East St. Louis	13.00	13.00	13.00	11.00
Lead, St. Louis	11.80	11.80	11.80	10.80
Aluminum, virgin ingot	28.10	28.10	28.10	26.80
Nickel, electrolytic	74.00	74.00	74.00	74.00
Magnesium, ingot	36.00	36.00	36.00	36.00
Antimony, Laredo, Tex.	29.50	29.50	29.50	29.50

† Tentative. ‡ Average. ** Revised.

Finished Steel Composite

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.

Pig Iron Composite

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo and Birmingham.

Steel Scrap Composites

Average of No. 1 heavy melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

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Is Market Starting To Firm Up?

Despite the lack of mill buying, some scattered signs of firmness are showing up.

They include: Dealer resistance, broker problems in covering old orders, and strong export movement.

■ The market shows scattered signs of firming. But the lack of buying by major mills continues to depress sales.

With the steel operating rate falling, dealers and brokers see small prospect of strong mill buying for some time. Nevertheless, there are evidences of growing strength in the market.

Export buying in coastal areas and via the Seaway in the Midwest is a strong stabilizer. Good—if not spectacular — buying of foundry grades is also encouraging dealers.

Resistance Grows — In some areas, especially the Midwest, brokers are having trouble covering old orders at existing prices. Supplies of No. 2 bundles are limited in that area. Dealer resistance there pushed up The IRON AGE price composites slightly.

With the amount of industrial tonnage falling off, some dealers predict a small price advance soon. They believe if scrap generation continues down, lack of supplies will push prices up.

But two trends apparently will dominate the market for the next few months. On the positive side will be export sales. And on the doubtful side will be heavy mill buying.

Pittsburgh — A mood of pessimism still persists in the market despite a little more activity. The buying lull ended when a local mill paid $35 and $36 for No. 1 heavy melting. Price was about the same as that paid a few weeks ago by a mill on the fringe of the district. And on a late list, No. 1 railroad heavy melting brought better than $41 from brokers. This was $4 over prices bid on earlier lists this month. However, the brokers say the market is closer to $40.

Chicago—Increased dealer resistance, plus export scrap buying, has firmed up the market. Brokers were unable to cover old orders for No. 1 heavy melting at existing prices. Broker buying prices for No. 2 dealer bundles moved up to $20 to $22. In addition, small export orders for No. 1 dealer heavy melting are being filled at $33. Foundry grades, both electric and cast, are firm with scattered price advances. As yet, however, major mills are not showing strong interest in scrap.

Philadelphia — With local sales just about non-existent, export activity is holding up the market. Most of the available tonnage is moving to the docks where three boats are loading with another expected in soon. With the district's steel operating rate falling, dealers are not optimistic about future sales locally. Collections are fairly good now that everyone has gotten used to lower prices.

New York—April and May export orders are strong. On the domestic market, dealers are discouraged by the lack of mill interest and the falling steel operating rate. Prices remain unchanged.

Detroit—Neither dealers nor brokers report much action. The market is quiet with consumers very fussy about their purchases. Industrial tonnages are down this month. If they continue to drop, there's a feeling a nominal price gain in dealer scrap may come in a few weeks.

Cleveland—The market here had a slight relapse as a small order for Valley delivery was placed at $36 for No. 1 dealer grades. Other buyers are holding out for prices of $35 a ton. A previous inside order from restricted Cleveland yards went at higher prices. But this was filled in one day with prices dropping again afterwards.

St. Louis—Prices remain in the doldrums in this market. More scrap is being offered than can be absorbed. There are no signs of strength in sight.

Cincinnati — The market is in good balance with a limited amount of tonnage moving. One area mill bought No. 1 grades on a limited scale at the quoted prices. Prices on No. 2 heavy melting rose $1.

Birmingham — Market continues slow. Openhearth and electric furnaces are generally not buying. One mill did return to order No. 2 bundles at the same price previously paid.

Buffalo—Prices are unchanged in an inactive market. Sales weakness is still the major story. There are reports that mill efforts to buy cast grades at lower prices will be resisted.

Boston—The market remains dull. There is only a trickle of domestic and export buying. Prices are unchanged with the exception of chemical borings, which dropped $1.

West Coast—Sales continue at a snail's pace. Exporting to Japan is about all that's holding up the market. The trade is gloomy about the immediate outlook.

Houston—Activity in the market centers on export sales. Tonnage is going to Mexican buyers. With foundries resisting prices, the cast market is weakening.

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SCRAP PRICES

(Effective April 12, 1960)

Iron and Steel Scrap

Going prices of iron and steel scrap as obtained in the trade by THE IRON AGE based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Pittsburgh

No. 1 hvy. melting	$34.00 to $35.00
No. 2 hvy. melting	29.00 to 30.00
No. 1 dealer bundles	36.00 to 37.00
No. 1 factory bundles	40.00 to 41.00
No. 2 bundles	26.00 to 27.00
No. 1 busheling	34.00 to 35.00
Machine Shop turn.	17.00 to 18.00
Shoveling turnings	22.00 to 23.00
Cast iron borings	21.00 to 22.00
Low phos. punch'gs plate	42.00 to 43.00
Heavy turnings	30.00 to 31.00
No. 1 RR hvy. melting	39.00 to 40.00
Scrap rails, random lgth	52.00 to 53.00
Rails 2 ft and under	58.00 to 59.00
RR specialties	46.00 to 47.00
No. 1 machinery cast	51.00 to 52.00
Cupola cast	45.00 to 46.00
Heavy breakable cast	43.00 to 44.00
Stainless	
18-8 bundles and solids	220.00 to 225.00
18-8 turnings	115.00 to 120.00
430 bundles and solids	125.00 to 130.00
410 turnings	60.00 to 65.00

Chicago

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	27.00 to 28.00
No. 1 dealer bundles	32.00 to 33.00
No. 1 factory bundles	36.00 to 37.00
No. 2 bundles	20.00 to 22.00
No. 1 busheling	30.00 to 31.00
Machine shop turn.	15.00 to 16.00
Mixed bor. and turn.	17.00 to 18.00
Shoveling turnings	17.00 to 18.00
Cast iron borings	17.00 to 18.00
Low phos. forge crops	43.00 to 44.00
Low phos. punch'gs plate, ¼ in. and heavier	39.00 to 40.00
Low phos. 2 ft and under	37.00 to 38.00
No. 1 RR hvy. melting	34.00 to 35.00
Scrap rails, random lgth	45.00 to 46.00
Rerolling rails	54.00 to 55.00
Rails 2 ft and under	52.00 to 53.00
Angles and splice bars	44.00 to 45.00
RR steel car axles	50.00 to 51.00
RR couplers and knuckles	41.00 to 42.00
No. 1 machinery cast	52.00 to 53.00
Cupola cast	46.00 to 47.00
Cast iron wheels	39.00 to 40.00
Malleable	50.00 to 51.00
Stove plate	42.00 to 43.00
Steel car wheels	42.00 to 43.00
Stainless	
18-8 bundles and solids	215.00 to 220.00
18-8 turnings	115.00 to 120.00
430 bundles and solids	115.00 to 120.00
430 turnings	55.00 to 60.00

Philadelphia Area

No. 1 hvy. melting	$34.00 to $35.00
No. 2 hvy. melting	30.00 to 31.00
No. 1 dealer bundles	36.00 to 37.00
No. 2 bundles	21.00 to 22.00
No. 1 busheling	36.00 to 37.00
Machine shop turn.	18.00 to 19.00
Mixed bor. short turn.	18.00 to 19.00
Cast iron borings	18.00 to 19.00
Shoveling turnings	22.00 to 23.00
Clean cast. chem. borings	25.00 to 26.00
Low phos. 5 ft and under	37.00 to 38.00
Low phos. 2 ft punch'gs	39.00 to 41.00
Elec. furnace bundles	37.00 to 38.00
Heavy turnings	28.00 to 29.00
RR specialties	43.00 to 44.00
Rails, 18 in. and under	58.00 to 60.00
Cupola cast	40.00 to 41.00
Heavy breakable cast	42.00 to 43.00
Cast iron car wheels	45.00 to 46.00
Malleable	55.00 to 56.00
No. 1 machinery cast	51.00 to 52.00

Cincinnati

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	27.00 to 28.00
No. 1 dealer bundles	31.00 to 32.00
No. 2 bundles	21.00 to 22.00
Machine shop turn.	15.00 to 16.00
Shoveling turnings	18.00 to 19.00
Cast iron borings	18.00 to 19.00
Low phos. 18 in. and under	40.00 to 41.00
Rails, random length	48.00 to 49.00
Rails, 18 in. and under	54.00 to 55.00
No. 1 cupola cast	41.00 to 42.00
Hvy. breakable cast	36.00 to 37.00
Drop broken cast	50.00 to 51.00

Youngstown

No. 1 hvy. melting	$35.00 to $36.00
No. 2 hvy. melting	27.00 to 28.00
No. 1 dealer bundles	35.00 to 36.00
No. 2 bundles	22.00 to 23.00
Machine shop turn.	16.00 to 17.00
Shoveling turnings	20.00 to 21.00
Low phos. plate	36.00 to 37.00

Cleveland

No. 1 hvy. melting	$32.00 to $33.00
No. 2 hvy. melting	23.50 to 24.50
No. 1 dealer bundles	32.00 to 33.00
No. 1 factory bundles	36.50 to 37.50
No. 2 bundles	19.00 to 20.00
No. 1 busheling	32.00 to 33.00
Machine shop turn.	13.00 to 14.00
Mixed bor. and turn.	17.00 to 18.00
Shoveling turnings	17.00 to 18.00
Cast iron borings	17.00 to 18.00
Cut structural & plates, 2 ft & under	39.00 to 40.00
Drop forge flashings	32.00 to 33.00
Low phos. punch'gs plate	33.00 to 34.00
Foundry steel, 2 ft & under	34.00 to 35.00
No. 1 RR hvy. melting	37.00 to 38.00
Rails 2 ft and under	57.00 to 58.00
Rails 18 in. and under	61.00 to 62.00
Steel axle turnings	24.00 to 25.00
Railroad cast	55.00 to 56.00
No. 1 machinery cast	55.00 to 56.00
Stove plate	48.00 to 49.00
Malleable	52.00 to 53.00
Stainless	
18-8 bundles	210.00 to 220.00
18-8 turnings	90.00 to 100.00
430 bundles	105.00 to 115.00

Buffalo

No. 1 hvy. melting	$30.00 to $31.00
No. 2 hvy. melting	27.00 to 28.00
No. 1 busheling	30.00 to 31.00
No. 1 dealer bundles	30.00 to 31.00
No. 2 bundles	22.00 to 23.00
Machine shop turn.	14.00 to 15.00
Mixed bor. and turn.	15.00 to 16.00
Shoveling turnings	18.00 to 19.00
Cast iron borings	16.00 to 17.00
Low phos. plate	40.00 to 41.00
Structurals and plate, 2 ft and under	40.00 to 41.00
Scrap rails, random lgth	38.00 to 39.00
Rails 2 ft and under	48.00 to 49.00
No. 1 machinery cast	48.00 to 49.00
No. 1 cupola cast	45.00 to 46.00

St. Louis

No. 1 hvy. melting	$33.00 to $34.00
No. 2 hvy. melting	31.00 to 32.00
Foundry steel, 2 ft	34.00 to 35.00
No. 1 dealer bundles	34.00 to 35.00
No. 2 bundles	21.00 to 22.00
Machine shop turn.	14.00 to 15.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	19.00 to 20.00
No. 1 RR hvy. melting	36.00 to 37.00
Rails, random lengths	43.00 to 44.00
Rails, 18 in. and under	47.00 to 48.00
RR specialties	42.00 to 43.00
Cupola cast	47.00 to 48.00
Heavy breakable cast	35.00 to 36.00
Stove plate	40.00 to 41.00
Cast iron car wheels	35.00 to 36.00
Rerolling rails	54.00 to 55.00
Unstripped motor blocks	38.00 to 39.00

Birmingham

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	26.00 to 27.00
No. 1 dealer bundles	31.00 to 32.00
No. 2 bundles	21.00 to 22.00
No. 1 busheling	35.00 to 36.00
Machine shop turn.	21.00 to 22.00
Shoveling turnings	22.00 to 23.00
Cast iron borings	12.00 to 13.00
Electric furnace bundles	35.00 to 36.00
Elec. furnace, 3 ft & under	33.00 to 34.00
Bar crops and plate	41.00 to 42.00
Structural and plate, 2 ft	40.00 to 41.00
No. 1 RR hvy. melting	33.00 to 34.00
Scrap rails, random lgth	45.00 to 46.00
Rails, 18 in. and under	50.00 to 51.00
Angles and splice bars	42.00 to 43.00
No. 1 cupola cast	48.00 to 49.00
Stove plate	48.00 to 49.00
Cast iron car wheels	38.00 to 39.00
Unstripped motor blocks	38.00 to 39.00

New York

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$31.00 to $32.00
No. 2 hvy. melting	22.00 to 23.00
No. 2 dealer bundles	16.00 to 17.00
Machine shop turnings	9.00 to 10.00
Mixed bor. and turn.	10.00 to 11.00
Shoveling turnings	11.00 to 12.00
Clean cast. chem. borings	20.00 to 21.00
No. 1 machinery cast	38.00 to 39.00
Mixed yard cast	35.00 to 36.00
Heavy breakable cast	33.00 to 34.00
Stainless	
18-8 prepared solids	195.00 to 200.00
18-8 turnings	85.00 to 90.00
430 prepared solids	80.00 to 85.00
430 turnings	20.00 to 25.00

Detroit

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$28.00 to $29.00
No. 2 hvy. melting	16.00 to 17.00
No. 1 dealer bundles	30.00 to 31.00
No. 2 bundles	15.00 to 16.00
No. 1 busheling	28.00 to 29.00
Drop forge flashings	28.00 to 29.00
Machine shop turn.	11.00 to 12.00
Mixed bor. and turn.	13.00 to 14.00
Shoveling turnings	13.00 to 14.00
Cast iron borings	13.00 to 14.00
Heavy breakable cast	37.00 to 38.00
Mixed cupola cast	43.00 to 44.00
Automotive cast	49.00 to 50.00
Stainless	
18-8 bundles and solids	195.00 to 200.00
18-8 turnings	65.00 to 70.00
430 bundles and solids	80.00 to 85.00

Boston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$27.00 to $28.00
No. 2 hvy. melting	22.00 to 23.00
No. 1 dealer bundles	27.00 to 28.00
No. 2 bundles	13.00 to 14.00
No. 1 busheling	27.00 to 28.00
Machine shop turn.	6.00 to 7.00
Shoveling turnings	9.00 to 10.00
Clean cast. chem. borings	13.00 to 14.00
No. 1 machinery cast	39.00 to 40.00
Mixed cupola cast	32.00 to 33.00
Heavy breakable cast	30.00 to 31.00

San Francisco

No. 1 hvy. melting	$34.00
No. 2 hvy. melting	30.00
No. 1 dealer bundles	30.00
No. 2 bundles	20.00
Machine shop turn.	$14.00 to 15.00
Cast iron borings	14.00 to 15.00
No. 1 cupola cast	44.00

Los Angeles

No. 1 hvy. melting	$32.00
No. 2 hvy. melting	29.00
No. 1 dealer bundles	27.00
No. 2 bundles	17.00
Machine shop turn.	15.00
Shoveling turnings	15.00
Cast iron boring	$15.00 to 16.00
Elec. furn. 1 ft. and under (foundry)	41.00
No. 1 cupola cast	38.00

Seattle

No. 1 hvy. melting	$35.00
No. 2 hvy. melting	33.00
No. 2 bundles	22.00
No. 1 cupola cast	36.00
Mixed yard cast	36.00

Hamilton, Ont.

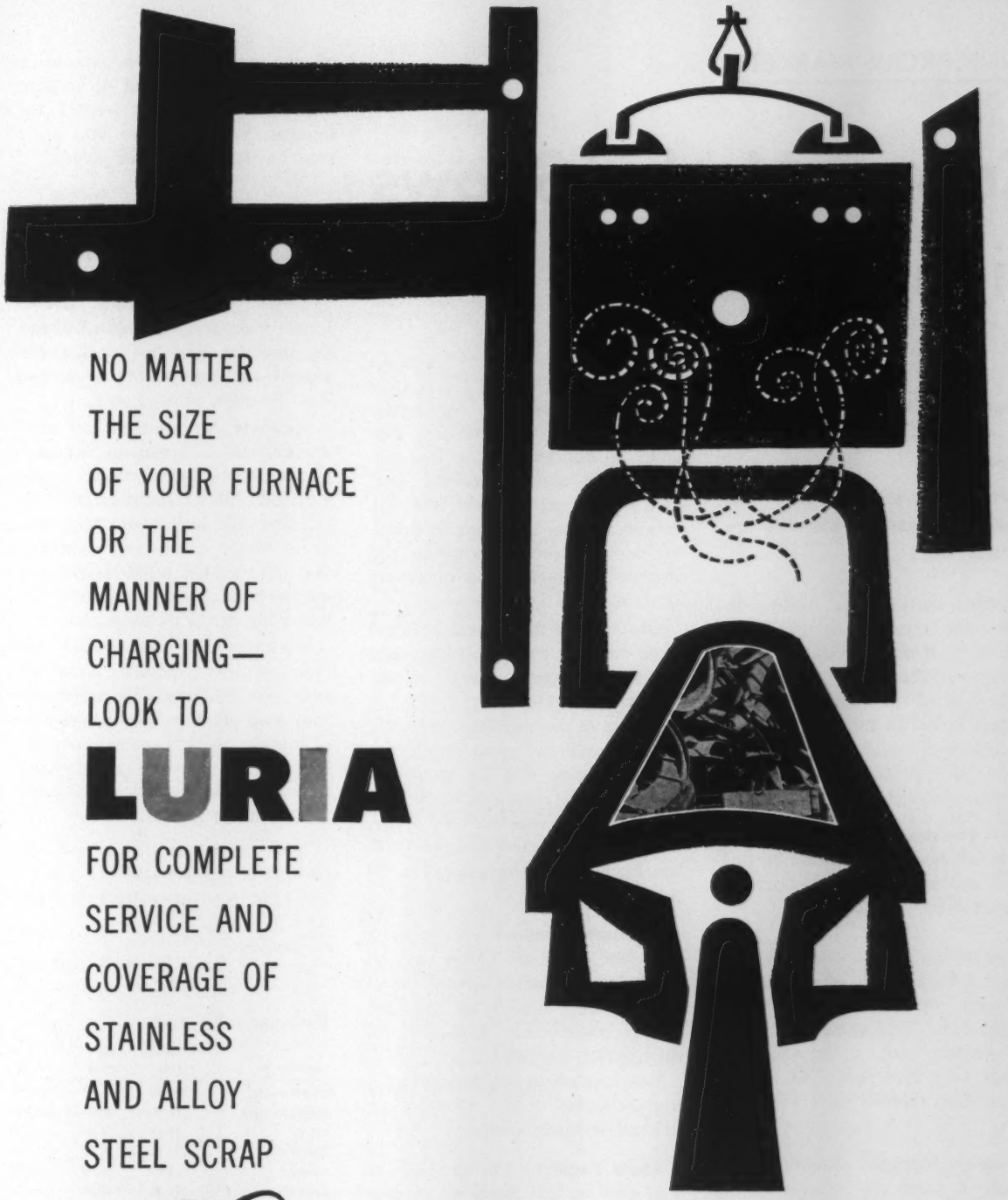
Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$32.25
No. 2 hvy. melting	28.25
No. 1 dealer bundles	32.25
No. 2 bundles	20.00
Mixed steel scrap	24.25
Bush., new fact., prep'd	32.25
Bush., new fact., unprep'd	26.25
Machine shop turn.	14.00
Short steel turn.	17.00
Mixed bor. and turn.	13.00
Cast scrap	$46.50 to 48.00

Houston

Brokers buying prices per gross ton on cars:

No. 1 hvy melting	$34.00
No. 2 hvy. melting	31.00
No. 2 bundles	19.00
Machine shop turn.	15.00
Shoveling turnings	17.00
Cut structural plate 2 ft & under	$40.00 to 41.00
Unstripped motor blocks	30.00 to 31.00
Cupola cast	35.00 to 36.00
Heavy breakable cast	27.00 to 28.00



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Copper Market Shows Signs of Strength

Signs of a strengthening copper market are beginning to appear.

But producers see no real trend in inventory building by customers.

▪ Copper markets are starting to show some signs of strength. But these are still more prediction than accomplished fact.

The first of the major producers to open its books for May delivery says it is very satisfied with the response. Most of its electrolytic copper was sold within a week.

No Pressure — However, other producers opening May books this week said there was no pressure from customers to do so any earlier.

The selling producer sees no particular trend toward rebuilding inventories by customers. "Some bought more, and some came into the market, but a lot actually bought less than they had during the previous month," says a spokesman.

Foreign Markets—Another indication of more strength to come: At least one U. S. producer has had a notable pickup in inquiries for metal from European buyers. Here's the appraisal of another copper seller on this:

He suggests that when the U. S. copper supply was strikebound many European fabricators shipped large chunks of their inventories to the U. S. for a premium price, figuring on buying it back for a lower price later.

Low Inventories — Apparently the time for this is about here. Demand is building up in Europe. Supplies of metal there are low. And buyers are worried that the riots and racial problems in South Africa will spread north to the copperbelt—chief source of supply for Europe.

Observers of the African political scene say this isn't too likely. But European buyers aren't taking chances.

In fact, while the trade generally says it's unlikely, some people are now suggesting that for at least a brief span this year the U. S. may become a net exporter of copper. With one small exception the U. S. has been a net importer for 20 years.

Optimistic Outlook—Some brass mills are optimistic. They say the break in the weather should favorably influence auto sales and residential construction starts, two of their major markets.

But just about all the mills say improvements aren't showing up in increased orders yet.

Close Parallel—The head of one mill says he had the price of copper and company sales charted. "When I put one chart on the other, it was amazing how closely they coincided," he says. If copper firms up, brass mills won't be far behind, this mill chief concludes.

Import Factor—One factor that is taking the edge off mill business is imports. All domestic mills pretty much agree on this.

"Imports are skimming the cream off our market," says a spokesman for one mill. The head of another mill figures that if it weren't for imports, he could have 400 more men on the job than at present.

Zinc

About 500,000 tons of zinc will be used for diecasting in 1965.

That's the prediction David Laine, secretary, American Diecasting Institute, gave last week at the annual meeting of the American Zinc Institute at St. Louis.

However, he says there are some danger signs that must be watched. Factors that might possibly cause a period of unstable prices are a big concern. He says: "Anything real or artificial, natural or legislated, that changes the price of zinc can adversely affect the competitive relationship of the diecasting."

Another area that should rate "high priority" includes color finishes, Mr. Laine says. He points out that such work is pushed hard in aluminum, and "must not be overlooked in zinc where vulnerability to competition from colored plastices is much greater."

Tin prices for the week: April 6—99.50; April 7—99.50; April 8—99.50; April 11—99.375; April 12—99.375*.

*Estimates.

Primary Prices

(cents per lb)	current price	last price	date of change
Aluminum pig	26.00	24.70	12/17/59
Aluminum ingot	28.10	26.80	12/17/59
Copper (E)	33.00	30-33	11/12/59
Copper (CS)	33.00	35.00	3/11/60
Copper (L)	33.00	31.50	11/9/59
Lead, St. L.	11.80	12.30	12/21/59
Lead, N. Y.	12.00	12.50	12/21/59
Magnesium ingot	36.00	34.50	8/13/59
Magnesium pig	35.25	33.75	8/13/59
Nickel	74.00	84.50	12/8/59
Titanium sponge	180-190	182-182	8/1/59
Zinc, E. St. L.	13.00	12.50	1/8/60
Zinc, N. Y.	13.50	13.00	1/8/60

ALUMINUM: 99% ingot COPPER: (E) = electrolytic, (CS) = custom smelters, electrolytic. (L) = lake. LEAD: common grade. MAGNESIUM: 99.8% pig Velasco, Tex. NICKEL: Port Colborne, Canada. ZINC: prime western. TIN: See above; Other primary prices, pg. 231.

MILL PRODUCTS

(Cents per lb unless otherwise noted)

ALUMINUM

(Base 30,000 lb, f.o.b. customer's plant)

Flat Sheet (Mill Finish and Plate)

("F" temper except 6061-0)

Alloy	.038	.048-.061	.077-.096	.136-.250
1100, 3003	47.8	47.3	46.2	45.1
5052	54.2	53.0	50.8	49.2
6061-0	51.0	49.8	47.9	46.0

Extruded Solid Shapes

Factor	6063 T-5	6062 T-6
1-17	44.7-46.2	53.2-60.8
18-32	45.2-46.8	57.7-79.9
33-38	48.8-51.4	83.3-94.5
39-44	58.7-62.4	99.9-121.0

Screw Machine Stock—2011-T-3

Size"	¼	⅜-⅝	¾-1	1¼-1½
Price	62.0	61.2	59.7	57.3

Roofing Sheet, Corrugated

(Per sheet, 26" wide base, 16,000 lb)

Length"→	72	96	120	144
.019 gage	$1.411	$1.884	$2.353	$2.823
.024 gage	1.762	2.349	2.937	3.524

MAGNESIUM

(F.o.b. shipping pt., carload frt. allowed)

Sheet and Plate

Type↓ Gage→	.250 3.00	.250-2.00	.188	.081	.032
AZ31B Stand. Grade	.....	67.9	69.0	77.9	103.1
AZ31B Spec.	.....	93.3	96.9	108.7	171.3
Tread Plate	.....	70.6	71.7	.....	.....
Tooling Plate	73.0	.....	.....	.....	.....

Extruded Shapes

factor→	6-8	12-14	24-26	36-38
Comm. Grade (AZ31C)	65.3	65.3	66.1	71.5
Spec. Grade (AZ31B)	84.6	85.7	90.6	104.2

Alloy Ingot

AZ91B (Die Casting) ..... 37.25 (delivered)
AZ63A, AZ92A, AZ91C (Sand Casting) 40.75 (Velasco, Tex.)

NICKEL, MONEL, INCONEL

(Base prices f.o.b. mill)

	"A" Nickel	Monel	Inconel
Sheet, CR	138	120	138
Strip, CR	124	108	138
Rod, bar, HR	107	89	109
Angles, HR	107	89	109
Plates, HR	130	110	126
Seamless tube	157	129	200
Shot, blocks	...	87	...

COPPER, BRASS, BRONZE

(Freight included in 5000 lbs)

	Sheet	Wire	Rod	Tube
Copper	57.13	.....	54.86	58.32
Brass, Yellow	50.57	50.86	50.26	54.23
Brass, Low	53.53	53.82	53.22	57.09
Brass, R L	54.58	54.87	54.27	58.14
Brass, Naval	55.12	.....	48.68	58.78
Muntz Metal	53.20	.....	48.26	.....
Comm. Bz.	56.17	56.46	55.86	59.48
Mang. Bz.	58.86	.....	52.21	.....
Phos. Bz. 5%	77.44	.....	78.19	.....

Free Cutting Brass Rod 36.06

TITANIUM

(Base prices f.o.b. mill)

Sheet and strip, commercially pure, $6.75-$13.00; alloy, $13.40-$17.00. Plate, HR, commercially pure, $5.25-$9.00; alloy, $8.00-$10.00. Wire, rolled and/or drawn, commercially pure, $5.55-$6.05; alloy, $5.55-$9.00; Bar, HR or forged, commercially pure, $4.00-$4.50; alloy, $4.00-$6.25; billets, HR, commercially pure, $3.20-$3.70; alloy, $3.20-$4.75.

PRIMARY METAL

(Cents per lb unless otherwise noted)

Antimony, American, Laredo, Tex.. 29.50
Beryllium Aluminum 5% Be, Dollars per lb contained Be $74.75
Beryllium copper, per lb conta'd Be. $43.00
Beryllium 97% lump or beads, f.o.b. Cleveland, Reading $71.50
Bismuth, ton lots ..... $ 2.25
Cadmium, del'd ..... $ 1.50
Calcium, 99.9% small lots ..... $ 4.55
Chromium, 99.8% metallic base.... $ 1.31
Cobalt, 97-99% (per lb).... $1.75 to $1.82
Germanium, per gm, f.o.b. Miami, Okla., refined ..... 29.95 to 36.95
Gold, U. S. Treas., per troy oz..... $35.00
Indium, 99.9%, dollars per troy oz. $2.25
Iridium, dollars per troy oz.... $75 to $85
Lithium, 98% ..... $9.00 to $12.00
Magnesium sticks, 10,000 lb. 57.00
Mercury, dollars per 76-lb flask f.o.b. New York ..... $213 to $215
Nickel oxide sinter at Buffalo, N. Y., or other U. S. points of entry, contained nickel 69.60
Palladium, dollars per troy oz.. $24 to $26
Platinum, dollars per troy oz.. $82 to $85
Rhodium ..... $137 to $140
Silver ingots (¢ per troy oz.)..... 91.375
Thorium, per kg. $43.00
Vanadium ..... $ 3.65
Zirconium sponge ..... $ 5.00

REMELTED METALS

Brass Ingot

(Cents per lb delivered, carloads)

85-5-5 ingot
- No. 115 ..... 29.25
- No. 120 ..... 28.25
- No. 123 ..... 27.25

80-10-10 ingot
- No. 305 ..... 33.75
- No. 315 ..... 31.50

88-10-2 ingot
- No. 210 ..... 42.00
- No. 215 ..... 38.75
- No. 245 ..... 34.00

Yellow ingot
- No. 405 ..... 23.75

Manganese bronze
- No. 421 ..... 28.25

Aluminum Ingot

(Cents per lb del'd 30,000 lb and over)

95-5 aluminum-silicon alloys
- 0.30 copper max. 25.75-26.00
- 0.60 copper max. 25.50-25.75

Piston alloys (No. 132 type)... 28.00-29.00
No. 12 alum. (No. 2 grade)... 24.75-25.25
108 alloy 25.25-25.75
195 alloy 27.75-28.75
13 alloy (0.60 copper max.).... 25.75-26.00
AXS-679 (1 pct zinc) 25.00-26.00

Steel deoxidizing aluminum notch bar granulated or shot
- Grade 1—95-97½% 25.25-26.25
- Grade 2—92-95% 24.00-25.00
- Grade 3—90-92% 23.00-24.00
- Grade 4—85-90% 22.50-23.50

(Effective Apr. 11, 1960)

SCRAP METAL

Brass Mill Scrap

(Cents per pound, add 1¢ per lb for shipments of 20,000 lb and over)

	Heavy	Turnings
Copper	29	28¼
Yellow brass	22¼	20¼
Red brass	25¾	25
Comm. bronze	26½	26
Mang. bronze	20¾	20
Free cutting rod ends.	21¼	

Customs Smelters Scrap

(Cents per pound carload lots, delivered to refinery)

- No. 1 copper wire 26½
- No. 2 copper wire 23¾
- Light copper 21½
- *Refinery brass 21¾
- Copper bearing material 21

*Dry copper content.

Ingot Makers Scrap

(Cents per pound carload lots, delivered to refinery)

- No. 1 copper wire 26½
- No. 2 copper wire 23½
- Light copper 21¼
- No. 1 composition 20½
- No. 1 comp. turnings 20
- Hvy. yellow brass solids 15
- Brass pipe 14½
- Radiators 16

Aluminum

- Mixed old cast. ..... 14½—15½
- Mixed new clips ..... 16½—17½
- Mixed turnings, dry ..... 15 —16

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Copper and Brass
- No. 1 copper wire ..... 23 —23½
- No. 2 copper wire ..... 20 —20½
- Light copper ..... 18 —18½
- Auto radiators (unsweated). 12½—13
- No. 1 composition ..... 16½—17
- No. 1 composition turnings.. 15½—16
- Cocks and faucets ..... 13 —13½
- Clean heavy yellow brass ... 11¾—12¼
- Brass pipe ..... 13½—14
- New soft brass clippings .... 14 —14½
- No. 1 brass rod turnings .... 11½—12

Aluminum
- Alum. pistons and struts .... 7½— 8
- Aluminum crankcase ..... 11¼—11¾
- 1100 (2s) aluminum clippings 15 —15½
- Old sheet and utensils ..... 11¼—11¾
- Borings and turnings ..... 7 — 7½
- Industrial castings ..... 11¼—11¾
- 2020 (24S) clippings ..... 12½—13

Zinc
- New zinc clippings ..... 7 — 7¼
- Old zinc ..... 4½— 5
- Zinc routings ..... 3¼— 3½
- Old die cast scrap ..... 2¾— 3

Nickel and Monel
- Pure nickel clippings 52-54
- Clean nickel turnings 40
- Nickel anodes 52-54
- Nickel rod ends 52-54
- New Monel clippings 28-29
- Clean Monel turnings 20-23
- Old sheet Monel 24-26
- Nickel silver clippings, mixed 18
- Nickel silver turnings, mixed 15

Lead
- Soft scrap lead ..... 8 — 8¼
- Battery plates (dry) ..... 3 — 3¼
- Batteries, acid free ..... 2 — 2¼

Miscellaneous
- Block tin ..... 75 —76
- No. 1 pewter ..... 55 —56
- Auto babbitt ..... 39 —40
- Mixed common babbitt ..... 9¾—10¼
- Solder joints ..... 13¼—13¾
- Siphon tops 41
- Small foundry type ..... 9¾—10¼
- Monotype ..... 9¾—10¼
- Lino. and stereotype ..... 8¾— 9
- Electrotype ..... 7½— 7¾
- Hand picked type shells ..... 5¼— 5¾
- Lino. and stereo. dross ..... 2¼— 2¾
- Electro dross ..... 2¼— 2¾

STEEL PRICES

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BILLETS, BLOOMS, SLABS			PIL-ING	SHAPES STRUCTURALS			STRIP					
		Carbon Rerolling Net Ton	Carbon Forging Net Ton	Alloy Net Ton	Sheet Steel	Carbon	Hi Str. Low Alloy	Carbon Wide-Flange	Hot-rolled	Cold-rolled	Hi Str. H.R. Low Alloy	Hi Str. C.R. Low Alloy	Alloy Hot-rolled	Alloy Cold-rolled
EAST	Bethlehem, Pa.			$119.00 *B3*		5.55 *B3*	8.10 *B3*	5.55 *B5*						
	Buffalo, N. Y.	$80.00 *R3, B3*	$99.50 *R3, B3*	$119.00 *R3, B3*	6.50 *B3*	5.55 *B3*	8.10 *B3*	5.55 *B3*	5.10 *B3,*	7.425 *S10, R7*	7.575 *B3*			
	Phila., Pa.									7.875 *P15*				
	Harrison, N. J.													15.55 *C11*
	Conshohocken, Pa.		$104.50 *A2*	$126.00 *A2*					5.15 *A2*		7.575 *A2*			
	New Bedford, Mass.									7.875 *R6*				
	Johnstown, Pa.	$80.00 *B3*	$99.50 *B3*	$119.00 *B3*		5.55 *B3*	8.10 *B3*							
	Boston, Mass.									7.975 *T8*				
	New Haven, Conn.									7.875 *D1*				
	Baltimore, Md.									7.425 *T8*				15.90 *T8*
	Phoenixville, Pa.					5.55 *P2*		5.55 *P2*						
	Sparrows Pt., Md.								5.10 *B3*		7.575 *B3*			
	New Britain, Wallingford, Conn.			$119.00 *N8*						7.875 *W1,S7*				
	Pawtucket, R. I. Worcester, Mass.									7.975 *N7, A5*				15.90 *N7* 15.70 *T8*
MIDDLE WEST	Alton, Ill.								5.30 *L1*					
	Ashland, Ky.								5.10 *A7*		7.575 *A7*			
	Canton-Massillon, Dover, Ohio		$102.00 *R3*	$119.00 *R3,* $114.00 *T5*						7.425 *G4*		10.80 *G4*		
	Chicago, Franklin Park, Evanston, Ill.	$80.00 *U1, R3*	$99.50 *U1, R3,W8*	$119.00 *U1, R3,W8*	6.50 *U1*	5.50 *U1, W8,P13*	8.05 *U1, Y1,W8*	5.50 *U1*	5.10 *W8, N4,A1*	7.525 *A1,T8, M8*	7.575 *W8*		8.40 *W8, S9,13*	15.55 *A1, S9,G4,T8*
	Cleveland, Ohio									7.425 *A5,J3*		10.75 *A5*	8.40 *J3*	
	Detroit, Mich.			$119.00 *R5*					5.10 *G3, M2*	7.425 *M2, S1, D1,P11*	7.575 *G3*	10.80 *S1*		
	Anderson, Ind.									7.425 *G4*				
	Gary, Ind. Harbor, Indiana	$80.00 *U1*	$99.50 *U1*	$119.00 *U1, Y1*		5.50 *U1, I3*	8.05 *U1, J3*	5.50 *I3*	5.10 *U1, I3,Y1*	7.425 *Y1*	7.575 *U1, I3,Y1*	10.90 *Y1*	8.40 *U1, Y1*	
	Sterling, Ill.	$80.00 *N4*				5.50 *N4*	7.75 *N4*	5.50 *N4*	5.20 *N4*					
	Indianapolis, Ind.									7.575 *R5*				15.70 *R5*
	Newport, Ky.								5.10 *A9*				8.40 *A9*	
	Niles, Warren, Ohio Sharon, Pa.		$99.50 *S1, C10*	$119.00 *C10,S1*					5.10 *R3, S1*	7.425 *R3, T4,S1*	7.575 *R3, S1*	10.80 *R3, S1*	8.40 *S1*	15.55 *S1*
	Owensboro, Ky.	$80.00 *G5*	$99.50 *G5*	$119.00 *G5*										
	Pittsburgh, Midland, Butler, Aliquippa, McKeesport, Pa.	$80.00 *U1, P6*	$99.50 *U1, C11,P6*	$119.00 *U1, C11,B7*	6.50 *U1*	5.50 *U1, J3*	8.05 *U1, J3*	5.50 *U1*	5.10 *P6*	7.425 *J3,B4* 7.525 *E3*			8.40 *S9*	15.55 *S9*
	Weirton, Wheeling, Follansbee, W. Va.				6.50 *U1, W3*	5.50 *W3*		5.50 *W3*	5.10 *W3*	7.425 *W5*	7.575 *W3*	10.80 *W3*		
	Youngstown, Ohio	$80.00 *R3*	$99.50 *Y1, C10*	$119.00 *Y1*			8.05 *Y1*		5.10 *U*	7.425 *Y1,R5*	7.575 *U1, Y1*	10.95 *Y1*	8.40 *U1, Y1*	15.55 *R5, Y1*
WEST	Fontana, Cal.	$90.50 *K1*	$109.00 *K1*	$140.00 *K1*		6.30 *K1*	8.85 *K1*	6.45 *K1*	5.825 *K1*	9.20 *K1*				
	Geneva, Utah		$99.50 *C7*			5.50 *C7*	8.05 *C7*							
	Kansas City, Mo.					5.60 *S2*	8.15 *S2*						8.65 *S2*	
	Los Angeles, Torrance, Cal.		$109.00 *B2*	$139.00 *B2*		6.20 *C7, B2*	8.75 *B2*		5.85 *C7, B2*	9.30 *C1,R5*			9.60 *B2*	17.75 *J3*
	Minnequa, Colo.					5.80 *C6*			6.20 *C6*	9.375 *C6*				
	Portland, Ore.					6.25 *O2*								
	San Francisco, Niles, Pittsburg, Cal.		$109.00 *B2*			6.15 *B2*	8.70 *B2*		5.85 *C7, B2*					
	Seattle, Wash.		$109.00 *B2*			6.25 *B2*	8.80 *B2*		6.10 *B2*					
SOUTH	Atlanta, Ga.					5.70 *A8*			5.10 *A8*					
	Fairfield, Ala. City, Birmingham, Ala.	$80.00 *T2*	$99.50 *T2*			5.50 *T2 R3,C16*	8.05 *T2*		5.10 *T2, R3,C16*		7.575 *T2*			
	Houston, Lone Star, Texas		$104.50 *S2*	$124.00 *S2*		5.60 *S2*	8.15 *S2*						8.65 *S2*	

(Effective April 11, 1960)

STEEL PRICES

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		SHEETS								WIRE ROD	TINPLATE†		
		Hot-rolled 18 ga. & hvyr.	Cold-rolled	Galvanized (Hot-dipped)	Enameling	Long Terne	Hi Str. Low Alloy H.R.	Hi Str. Low Alloy C.R.	Hi Str. Low Alloy Galv.		Cokes* 1.25-lb. base box	Electro** 0.25-lb. base box	Holloware Enameling 29 ga.
EAST	Buffalo, N. Y.	5.10 *B3*	6.275 *B3*				7.525 *B3*	9.275 *B3*		6.40 *W6*	† Special coated mfg. terne deduct 35¢ from 1.25-lb. coke base box price, 0.75 lb., 0.25 lb. add 55¢. Can-making quality BLACKPLATE 55 to 128 lb. deduct $2.20 from 1.25 lb. coke base box. * COKES: 1.50-lb. add 25¢. **ELECTRO: 0.50-lb. add 25¢; 0.75-lb. add 65¢; 1.00-lb. add $1.00. Differential 1.00 lb./0.25 lb. add 65¢.		
	Claymont, Del.												
	Coatesville, Pa.												
	Conshohocken, Pa.	5.15 *A2*	6.325 *A2*				7.575 *A2*						
	Harrisburg, Pa.												
	Hartford, Conn.												
	Johnstown, Pa.									6.40 *B3*			
	Fairless, Pa.	5.15 *U1*	6.325 *U1*				7.575 *U1*	9.325 *U1*			$10.50 *U1*	$9.20 *U1*	
	New Haven, Conn.												
	Phoenixville, Pa.												
	Sparrows Pt., Md.	5.10 *B3*	6.275 *B3*	6.875 *B3*	6.775 *B3*		7.525 *B3*	9.275 *B3*	10.025 *B3*	6.50 *B3*	$10.40 *B3*	$9.10 *B3*	
	Worcester, Mass.									6.70 *A5*			
	Trenton, N. J.												
MIDDLE WEST	Alton, Ill.									6.60 *L1*			
	Ashland, Ky.	5.10 *A7*		6.875 *A7*	6.775 *A7*		7.525 *A7*						
	Canton-Massillon, Dover, Ohio			6.875 *R1, R3*									
	Chicago, Joliet, Ill.	5.10 *W8, A1*					7.525 *U1, W8*			6.40 *A5, R3, W8*			
	Sterling, Ill.									6.50 *N4, K2*			
	Cleveland, Ohio	5.10 *R3, J3*	6.275 *R3, J3*	7.65 *R3**	6.775 *R3*		7.525 *R3, J3*	9.275 *R3, J3*		6.40 *A5*			
	Detroit, Mich.	5.10 *G3, M2*	6.275 *G3, M2*				7.525 *G3*	9.275 *G3*					
	Newport, Ky.	5.10 *A9*	6.275 *A9*										
	Gary, Ind. Harbor, Indiana	5.10 *U1, I3, Y1*	6.275 *U1, I3, Y1*	6.875 *U1, I3*	6.775 *U1, I3, Y1*	7.225 *U1*	7.525 *U1, Y1, I3*	9.275 *U1, Y1*		6.40 *Y1*	$10.40 *U1, Y1*	$9.10 *I3, U1, Y1*	7.85 *U1, Y1*
	Granite City, Ill.	5.20 *G2*	6.375 *G2*	6.975 *G2*								$9.20 *G2*	7.95 *G2*
	Kokomo, Ind.			6.975 *C9*						6.50 *C9*			
	Mansfield, Ohio	5.10 *E2*	6.275 *E2*			7.225 *E2*							
	Middletown, Ohio		6.275 *A7*	6.875 *A7*	6.775 *A7*	7.225 *A7*							
	Niles, Warren, Ohio Sharon, Pa.	5.10 *R3, S1*	6.275 *R3*	6.875 *R3* 7.65 *R3**	6.775 *S1*	7.225 *S1**, *R3*	7.525 *R3, S1*	9.275 *R3,*				$9.10 *R3*	
	Pittsburgh, Midland, Butler, Donora, Aliquippa, McKeesport, Pa.	5.10 *U1, J3, P6*	6.275 *U1, J3, P6*	6.875 *U1, J3* 7.50 *E3**	6.775 *U1*		7.525 *U1, J3*	9.275 *U1, J3*	10.025 *U1, J3*	6.40 *A5, J3, P6*	$10.40 *U1, J3*	$9.10 *U1, J3*	7.85 *U1, J3*
	Portsmouth, Ohio	5.10 *P7*	6.275 *P7*							6.40 *P7*			
	Weirton, Wheeling, Follansbee, W. Va.	5.10 *W3, W5*	6.275 *W3, F3, W5*	6.875 *W3, W5* 7.50 *W3**		7.225 *W3, W5*	7.525 *W3*	9.275 *W3*			$10.40 *W5, W3*	$9.10 *W5, W3*	7.85 *W5*
	Youngstown, Ohio	5.10 *U1, Y1*	6.275 *Y1*	7.50 *J3**	6.775 *Y1*		7.525 *Y1*	9.275 *Y1*		6.40 *Y1*			
WEST	Fontana, Cal.	5.825 *K1*	7.40 *K1*				8.25 *K1*	10.40 *K1*			$11.05 *K1*	$9.75 *K1*	
	Geneva, Utah	5.20 *C7*											
	Kansas City, Mo.									6.65 *S2*			
	Los Angeles, Torrance, Cal.									7.20 *B2*			
	Minnequa, Colo.									6.65 *C6*			
	San Francisco, Niles, Pittsburg, Cal.	5.80 *C7*	7.225 *C7*	7.625 *C7*						7.20 *C7*	$11.05 *C7*	$9.75 *C7*	
SOUTH	Atlanta, Ga.												
	Fairfield, Ala. Alabama City, Ala.	5.10 *T2, R3*	6.275 *T2, R3*	6.875 *T2, R3*	6.775 *T2*					6.40 *T2, R3*	$10.50 *T2*	$9.20 *T2*	
	Houston, Texas									6.65 *S2*			

*Electrogalvanized sheets.

(Effective April 11, 1960)

*7.425 at Sharon-Niles is 7.225

STEEL PRICES

Italics identify producers listed in key at end of table. Base prices, f.o.b. mill, in cents per lb., unless otherwise noted. Extras apply.

		BARS						PLATES				WIRE
		Carbon† Steel	Reinforcing	Cold Finished	Alloy Hot-rolled	Alloy Cold Drawn	Hi Str. H.R. Low Alloy	Carbon Steel	Floor Plate	Alloy	Hi Str. Low Alloy	Mfr's. Bright
EAST	Bethlehem, Pa.				6.725 *B3*	9.025 *B3*	8.30 *B3*					
	Buffalo, N. Y.	5.675 *R3,B3*	5.675 *R3,B3*	7.70 *B5*	6.725 *B3,R3*	9.025 *B3,B5*	8.30 *B3*	5.30 *B3*				8.00 *W6*
	Claymont, Del.							5.30 *C4*		7.50 *C4*	7.95 *C4*	
	Coatesville, Pa.							5.30 *L4*		7.50 *L4*	7.95 *L4*	
	Conshohocken, Pa.							5.30 *A2*	6.375 *A2*	7.50 *A2*	7.95 *A2*	
	Harrisburg, Pa.							5.30 *P2*	6.375 *P2*			
	Milton, Pa.	5.825 *M7*	5.825 *M7*									
	Hartford, Conn.			8.15 *R3*		9.325 *R3*						
	Johnstown, Pa.	5.675 *B3*	5.675 *B3*		6.725 *B3*		8.30 *B3*	5.30 *B3*		7.50 *B3*	7.95 *B3*	8.00 *B3*
	Fairless, Pa.	5.825 *U1*	5.825 *U1*		6.875 *U1*							
	Newark, Camden, N. J.			8.10 *W10, P10*		9.20 *W10, P10*						
	Bridgeport, Putnam, Willimantic, Conn.			8.20 *W10* 8.15 *J3*	6.80 *N8*	9.175 *N8*						
	Sparrows Pt., Md.		5.675 *B3*					5.30 *B3*		7.50 *B3*	7.95 *B3*	8.10 *B3*
	Palmer, Worcester, Readville, Mansfield, Mass.			8.20 *B5, C14*		9.325 *A5,B5*						8.30 *A5, W6*
	Spring City, Pa.			8.10 *K4*		9.20 *K4*						
MIDDLE WEST	Alton, Ill.	5.875 *L1*										8.20 *L1*
	Ashland, Newport, Ky.							5.30 *A7, A9*		7.50 *A9*	7.95 *A7*	
	Canton, Massillon, Mansfield, Ohio	6.15* *R3*		7.65 *R3,R2*	6.725 *R3* 6.475 *T5*	9.025 *R3,R2* 8.775 *T5*		5.30 *E2*				
	Chicago, Joliet, Waukegan, Madison, Harvey, Ill.	5.675 *U1,R3, W8,N4,P13*	5.675 *U1,R3, N4,P13,W8* 5.875 *L1*	7.65 *A5, W10,W8, B5,L2,N9*	6.725 *U1,R3, W8*	9.025 *A5, W10,W8, L2,N8,B5*	8.30 *U1,W8, R3*	5.30 *U1,A1, W8,13*	6.375 *U1*	7.50 *U1, W8*	7.95 *U1, W8*	8.00 *A5,R3, W8,N4, K2,W7*
	Cleveland, Elyria, Ohio	5.675 *R3*	5.675 *R3*	7.65 *A5,C13, C18*		9.025 *A5, C13,C18*	8.30 *R3*	5.30 *R3,J3*	6.375 *J3*		7.95 *R3,J3*	8.00 *A5, C13,C18*
	Detroit, Mich.	5.675 *G3*	5.675 *G3*	7.90 *P3* 7.85 *P8,B5* 7.65 *R5*	6.725 *R5,G3*	9.025 *R5* 9.225 *B5,P3, P8*	8.30 *G3*	5.30 *G3*		7.50 *G3*	7.95 *G3*	
	Duluth, Minn.											8.00 *A5*
	Gary, Ind. Harbor, Crawfordsville, Hammond, Ind.	5.675 *U1,I3, Y1*	5.675 *U1,I3, Y1*	7.65 *R3,J3*	6.725 *U1,I3, Y1*	9.025 *R3,M4*	8.30 *U1,Y1*	5.30 *U1,I3, Y1*	6.375 *J3, I1*	7.50 *U1, Y1*	7.95 *U1, Y1,I3*	8.10 *M4*
	Granite City, Ill.							5.40 *G2*				
	Kokomo, Ind.		5.775 *C9*									8.10 *C9*
	Sterling, Ill.	5.775 *N4*	5.775 *N4*					5.30 *N4*				8.10 *K2*
	Niles, Warren, Ohio Sharon, Pa.			7.65 *C10*	6.725 *C10,*	9.025 *C10*		5.30 *R3,S1*		7.50 *S1*	7.95 *R3, S1*	
	Owensboro, Ky.	5.675 *G5*			6.725 *G5*							
	Pittsburgh, Midland, Donora, Aliquippa, Pa.	5.675 *U1,J3*	5.675 *U1,J3*	7.65 *A5,B4, R3,J3,C11, W10,S9,C8, M9*	6.725 *U1,J3, C11,B7*	9.025 *A5, W10,R3,S9, C11,C8,M9*	8.30 *U1,J3*	5.30 *U1,J3*	6.375 *U1,J3*	7.50 *U1, J3,B7*	7.95 *U1, J3,B7*	8.00 *A5, J3,P6*
	Portsmouth, Ohio											8.00 *P7*
	Weirton, Wheeling, Follansbee, W. Va.							5.30 *W5*				
	Youngstown, Ohio	5.675 *U1,R3, Y1*	5.675 *U1,R3, Y1*	7.65 *A1,Y1, F2*	6.725 *U1,Y1*	9.025 *Y1,F2*	8.30 *U1,Y1*	5.30 *U1, R3,Y1*		7.50 *Y1*	7.95 *U1,Y1*	8.00 *Y1*
WEST	Emeryville, Fontana, Cal.	6.425 *J5* 6.375 *K1*	6.425 *J5* 6.375 *K1*		7.775 *K1*		9.00 *K1*	6.10 *K1*		8.30 *K1*	8.75 *K1*	
	Geneva, Utah							5.30 *C7*			7.95 *C7*	
	Kansas City, Mo.	5.925 *S2*	5.925 *S2*		6.975 *S2*		8.55 *S2*					8.25 *S2*
	Los Angeles, Torrance, Cal.	6.375 *C7,B2*	6.375 *C7,B2*	9.10 *R3,P14, B5*	7.775 *B2*	11.00 *P14, B5*	9.00 *B2*					8.95 *B2*
	Minnequa, Colo.	6.125 *C6*	6.125 *C6*					6.15 *C6*				8.25 *C6*
	Portland, Ore.	6.425 *O2*	6.425 *O2*									
	San Francisco, Niles, Pittsburg, Cal.	6.375 *C7* 6.425 *B2*	6.375 *C7* 6.425 *B2*				9.05 *B2*					8.95 *C7,C6*
	Seattle, Wash.	6.425 *B2,N6, A10*	6.425 *B2,A10 N6*				9.05 *B2*	6.20 *B2*		8.40 *B2*	8.85 *B2*	
SOUTH	Atlanta, Ga.	5.875 *A8*	5.675 *A8*									8.00 *A8*
	Fairfield City, Ala. Birmingham, Ala.	5.675 *T2,R3, C16*	5.675 *T2,R3, C16*	8.25 *C16*			8.30 *T2*	5.30 *T2,R3*			7.95 *T2*	8.00 *T2,R3*
	Houston, Ft. Worth, Lone Star, Texas	5.925 *S2*	5.925 *S2*		6.975 *S2*		8.55 *S2*	5.40 *S2*		7.60 *S2*	8.05 *S2*	8.25 *S2*

† Merchant Quality—Special Quality 35¢ higher. (Effective April 11, 1960) * Special Quality.

STEEL PRICES

Key to Steel Producers

With Principal Offices

A1 Acme Steel Co., Chicago
A2 Alan Wood Steel Co., Conshohocken, Pa.
A3 Allegheny Ludlum Steel Corp., Pittsburgh
A4 American Cladmetals Co., Carnegie, Pa.
A5 American Steel & Wire Div., Cleveland
A6 Angel Nail & Chaplet Co., Cleveland
A7 Armco Steel Corp., Middletown, Ohio
A8 Atlantic Steel Co., Atlanta, Ga.
A9 Acme-Newport Steel Co., Newport, Ky.
A10 Alaska Steel Mills, Inc., Seattle, Wash.

B1 Babcock & Wilcox Tube Div., Beaver Falls, Pa.
B2 Bethlehem Steel Co., Pacific Coast Div.
B3 Bethlehem Steel Co., Bethlehem, Pa.
B4 Blair Strip Steel Co., New Castle, Pa.
B5 Bliss & Laughlin, Inc., Harvey, Ill.
B6 Brook Plant, Wickwire-Spencer Steel Div., Birdsboro, Pa.
B7 A. M. Byers, Pittsburgh
B8 Braeburn Alloy Steel Corp., Braeburn, Pa.

C1 Calstrip Steel Corp., Los Angeles
C2 Carpenter Steel Co., Reading, Pa.
C4 Claymont Products Dept., Claymont, Del.
C6 Colorado Fuel & Iron Corp., Denver
C7 Columbia Geneva Steel Div., San Francisco
C8 Columbia Steel & Shafting Co., Pittsburgh
C9 Continental Steel Corp., Kokomo, Ind.
C10 Copperweld Steel Co., Pittsburgh, Pa.
C11 Crucible Steel Co. of America, Pittsburgh
C13 Cuyahoga Steel & Wire Co., Cleveland
C14 Compressed Steel Shafting Co., Readville, Mass.
C15 G. O. Carlson, Inc., Thorndale, Pa.
C16 Connors Steel Div., Birmingham
C18 Cold Drawn Steel Plant, Western Automatic Machine Screw Co., Elyria, O.

D1 Detroit Steel Corp., Detroit
D2 Driver, Wilbur B., Co., Newark, N. J.
D3 Driver Harris Co., Harrison, N. J.
D4 Dickson Weatherproof Nail Co., Evanston, Ill.

E1 Eastern Stainless Steel Corp., Baltimore
E2 Empire-Reeves Steel Corp., Mansfield, O.
E3 Enamel Products & Plating Co., McKeesport, Pa.

F1 Firth Sterling, Inc., McKeesport, Pa.
F2 Fitzsimons Steel Corp., Youngstown
F3 Follansbee Steel Corp., Follansbee, W. Va.

G2 Granite City Steel Co., Granite City, Ill.
G3 Great Lakes Steel Corp., Detroit
G4 Greer Steel Co., Dover, O.
G5 Green River Steel Corp., Owenboro, Ky.

H1 Hanna Furnace Corp., Detroit

I2 Ingersoll Steel Div., New Castle, Ind.
I3 Inland Steel Co., Chicago, Ill.
I4 Interlake Iron Corp., Cleveland

J1 Jackson Iron & Steel Co., Jackson, O.
J2 Jessop Steel Corp., Washington, Pa.
J3 Jones & Laughlin Steel Corp., Pittsburgh
J4 Joslyn Mfg. & Supply Co., Chicago
J5 Judson Steel Corp., Emeryville, Calif.

K1 Kaiser Steel Corp., Fontana, Calif.
K2 Keystone Steel & Wire Co., Peoria
K4 Keystone Drawn Steel Co., Spring City, Pa.

L1 Laclede Steel Co., St. Louis
L2 La Salle Steel Co., Chicago
L3 Lone Star Steel Co., Dallas
L4 Lukens Steel Co., Coatesville, Pa.

M1 Mahoning Valley Steel Co., Niles, O.
M2 McLouth Steel Corp., Detroit
M3 Mercer Tube & Mfg. Co., Sharon, Pa.
M4 Mid States Steel & Wire Co., Crawfordsville, Ind.
M6 Mystic Iron Works, Everett, Mass.
M7 Milton Steel Products Div., Milton, Pa.
M8 Mill Strip Products Co., Chicago, Ill.
M9 Moltrup Steel Products Co., Beaver Falls, Pa.

N1 National Supply Co., Pittsburgh
N2 National Tube Div., Pittsburgh
N4 Northwestern Steel & Wire Co., Sterling, Ill.
N6 Northwest Steel Rolling Mills, Seattle
N7 Newman Crosby Steel Co., Pawtucket, R. I.
N8 Carpenter Steel of New England, Inc., Bridgeport, Conn.
N9 Nelson Steel & Wire Co.

O1 Oliver Iron & Steel Co., Pittsburgh
O2 Oregon Steel Mills, Portland

P1 Page Steel & Wire Div., Monessen, Pa.
P2 Phoenix Steel Corp., Phoenixville, Pa.
P3 Pilgrim Drawn Steel Div., Plymouth, Mich.
P4 Pittsburgh Coke & Chemical Co., Pittsburgh
P6 Pittsburgh Steel Co., Pittsburgh
P7 Portsmouth Div., Detroit Steel Corp., Detroit
P8 Plymouth Steel Co., Detroit
P9 Pacific States Steel Co., Niles, Cal.
P10 Precision Drawn Steel Co., Camden, N. J.
P11 Production Steel Strip Corp., Detroit
P13 Phoenix Mfg. Co., Joliet, Ill.
P14 Pacific Tube Co.
P15 Philadelphia Steel and Wire Corp.

R1 Reeves Steel & Mfg. Div., Dover, O.
R2 Reliance Div., Eaton Mfg. Co., Massillon, O.
R3 Republic Steel Corp., Cleveland
R4 Roebling Sons Co., John A., Trenton, N. J.
R5 Jones & Laughlin Steel Corp., Stainless and Strip Div.
R6 Rodney Metals, Inc., New Bedford, Mass.
R7 Rome Strip Steel Co., Rome, N. Y.

S1 Sharon Steel Corp., Sharon Pa.
S2 Sheffield Steel Div., Kansas City
S3 Shenango Furnace Co., Pittsburgh
S4 Simonds Saw and Steel Co., Fitchburg, Mass.
S5 Sweet's Steel Co., Williamsport, Pa.
S7 Stanley Works, New Britain, Conn.
S8 Superior Drawn Steel Co., Monaca, Pa.
S9 Superior Steel Div. of Copperweld Steel Co., Carnegie, Pa.
S10 Seneca Steel Service, Buffalo
S11 Southern Electric Steel Co., Birmingham
S12 Sierra Drawn Steel Corp., Los Angeles, Calif.
S13 Seymour Mfg. Co., Seymour, Conn.
S14 Screw and Bolt Corp. of America, Pittsburgh, Pa.

T1 Tonawanda Iron Div., N. Tonawanda, N. Y.
T2 Tennessee Coal & Iron Div., Fairfield
T3 Tennessee Products & Chem. Corp., Nashville
T4 Thomas Strip Div., Warren, O.
T5 Timken Steel & Tube Div., Canton, O.
T7 Texas Steel Co., Fort Worth
T8 Thompson Wire Co., Boston

U1 United States Steel Corp., Pittsburgh
U2 Universal-Cyclops Steel Corp., Bridgeville, Pa.
U3 Ulbrich Stainless Steels, Wallingford, Conn.
U4 U. S. Pipe & Foundry Co., Birmingham

W1 Wallingford Steel Co., Wallingford, Conn.
W2 Washington Steel Corp., Washington, Pa.
W3 Weirton Steel Co., Weirton, W. Va.
W4 Wheatland Tube Co., Wheatland, Pa.
W5 Wheeling Steel Corp., Wheeling, W. Va.
W6 Wickwire Spencer Steel Div., Buffalo
W7 Wilson Steel & Wire Co., Chicago.
W8 Wisconsin Steel Div., S. Chicago, Ill.
W9 Woodward Iron Co., Woodward, Ala.
W10 Wyckoff Steel Co., Pittsburgh
W12 Wallace Barnes Steel Div., Bristol, Conn.

Y1 Youngstown Sheet & Tube Co., Youngstown, O.

PIPE AND TUBING

Base discounts (pct) f.o.b. mills. Base price about $200 per net ton.

STANDARD T. & C.	BUTTWELD ½ In. Blk.	½ In. Gal.	¾ In. Blk.	¾ In. Gal.	1 In. Blk.	1 In. Gal.	1¼ In. Blk.	1¼ In. Gal.	1½ In. Blk.	1½ In. Gal.	2 In. Blk.	2 In. Gal.	2½-3 In. Blk.	2½-3 In. Gal.	SEAMLESS 2 In. Blk.	2 In. Gal.	2½ In. Blk.	2½ In. Gal.	3 In. Blk.	3 In. Gal.	3½-4 In. Blk.	3½-4 In. Gal.
Sparrows Pt. *B3*	0.25	+15.0	3.25	+11.0	6.75	+6.50	9.25	+5.75	9.75	+4.75	10.25	+4.25	11.75	+4.50	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *R3*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	.....	.....	.....	.....	.....	.....	.....	.....
Fontana *K1*	+10.75	+26.00	+7.75	+22.00	+4.25	+17.50	+1.75	+16.75	+1.25	+15.75	+0.75	+15.25	0.75	+15.50	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *J3*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	+12.25	+27.25	+5.75	+22.50	+3.25	+20.0	+1.75	+18.50
Alton, Ill. *L1*	0.25	+15.0	3.25	+11.0	6.75	+6.50	9.25	+5.75	9.75	+4.75	10.25	+4.25	11.75	+4.50	.....	.....	.....	.....	.....	.....	.....	.....
Sharon *M3*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	.....	.....	.....	.....	.....	.....	.....	.....
Fairless *N2*	0.25	+15.0	3.25	+11.0	6.75	+6.50	9.25	+5.75	9.75	+4.75	10.25	+4.25	11.75	+4.50	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *N1*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	+12.25	+27.25	+5.75	+22.50	+3.25	+20.0	+1.75	+18.50
Wheeling *W5*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	.....	.....	.....	.....	.....	.....	.....	.....
Wheatland *W4*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *Y1*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	+12.25	+27.25	+5.75	+22.50	+3.25	+20.0	+1.75	+18.50
Indiana Harbor *Y1*	1.25	+14.0	4.25	+10.0	7.75	+5.50	10.25	+4.75	10.75	+3.75	11.25	+3.25	12.75	+3.50	.....	.....	.....	.....	.....	.....	.....	.....
Lorain *N2*	2.25	+13.0	5.25	+9.0	8.75	+4.50	11.25	+3.75	11.75	+2.75	12.25	+2.25	13.75	+2.50	+12.25	+27.25	+5.75	+22.50	+3.25	+20.0	+1.75	+18.50
EXTRA STRONG PLAIN ENDS																						
Sparrows Pt. *B3*	4.75	+9.0	8.75	+5.0	11.75	+0.50	12.25	+1.75	12.75	+0.75	13.25	+0.25	13.75	+1.50	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *R3*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	.....	.....	.....	.....	.....	.....	.....	.....
Fairless *N2*	4.75	+9.0	8.75	+5.0	11.75	+0.50	12.25	+1.75	12.75	+0.75	13.25	+0.25	13.75	+1.50	.....	.....	.....	.....	.....	.....	.....	.....
Fontana *K1*	+6.25	.....	+2.25	.....	0.75	.....	1.25	.....	1.75	.....	2.25	.....	2.75	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *J3*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	+10.75	+24.75	+3.25	+19.0	+0.75	+16.50	4.25	+11.50
Alton, Ill. *L1*	4.75	+9.0	8.75	+5.0	11.75	+0.50	12.25	+1.75	12.75	+0.75	13.25	+0.25	13.75	+1.50	.....	.....	.....	.....	.....	.....	.....	.....
Sharon *M3*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	.....	.....	.....	.....	.....	.....	.....	.....
Pittsburgh *N1*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	+10.75	+24.75	+3.25	+19.0	+0.75	+16.50	4.25	+11.50
Wheeling *W5*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	.....	.....	.....	.....	.....	.....	.....	.....
Wheatland *W4*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown *Y1*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	+10.75	+24.75	+3.25	+19.0	+0.75	+16.50	4.25	+11.50
Indiana Harbor *Y1*	5.75	+8.0	9.75	+4.0	12.75	0.50	13.25	+0.75	13.75	0.25	14.25	0.75	14.75	+0.50	.....	.....	.....	.....	.....	.....	.....	.....
Lorain *N2*	6.75	+7.0	10.75	+3.0	13.75	1.50	14.25	0.25	14.75	1.25	15.25	1.75	15.75	0.50	+10.75	+24.75	+3.25	+19.0	+0.75	+16.50	4.25	+11.50

Threads only, buttweld and seamless, 2¼ pt. higher discount. Plain ends, buttweld and seamless, 3-in. and under, 5½ pt. higher discount.
Galvanized discounts based on zinc price range of over 9¢ to 11¢ per lb. East St. Louis. For each 2¢ change in zinc, discounts vary as follows: ½, ¾ and 1-in., 2 pt.; 1¼, 1½ and 2-in., 1½ pt.; 2½ and 3-in., 1 pt., e.g., zinc price range of over 13¢ to 15¢ would lower discounts on 2½ and 3-in. pipe by 2 points; zinc price in range over 7¢ to 9¢ would increase discounts. East St. Louis zinc price now 13.00¢ per lb.

(Effective April 11, 1960)

TOOL STEEL

F.o.b. mill

W	Cr	V	Mo	Co	per lb	SAE
18	4	1	—	—	$1.84	T-1
18	4	1	—	5	2.545	T-4
18	4	2	—	—	2.005	T-2
1.5	4	1.5	8	—	1.20	M-1
6	4	3	6	—	1.59	M-3
6	4	2	5	—	1.345	M-2
High-carbon chromium					.955	D-3, D-5
Oil hardened manganese					.505	O-2
Special carbon					.38	W-1
Extra carbon					.38	W-1
Regular carbon					.325	W-1

Warehouse prices on and east of Mississippi are 4¢ per lb higher. West of Mississippi, 6¢ higher.

CLAD STEEL

Base prices, cents per lb f.o.b.

	Cladding	Plate (*L4, C4, A3, J2*) 10 pct	Plate (*L4, C4, A3, J2*) 15 pct	Plate (*L4, C4, A3, J2*) 20 pct	Sheet (*I2*) 20 pct
Stainless Type	302	.....	.....	.....	37.50
	304	28.80	31.55	34.30	40.00
	316	42.20	46.25	50.25	58.75
	321	34.50	37.75	41.05	47.25
	347	40.80	44.65	48.55	57.00
	405	24.60	26.90	29.25	.....
	410	22.70	24.85	27.00	.....
	430	23.45	25.65	27.90	.....

CR Strip (S9) Copper, 10 pct, 2 sides, 44.20; 1 side, 36.80.

RAILS, TRACK SUPPLIES

F.o.b. Mill Cents Per Lb	No. 1 Std. Rails	Light Rails	Joint Bars	Track Spikes	Tie Plates	Track Bolts Untreated
Bessemer *U1*	5.75	6.725	7.25	.....	.....	.....
Cleveland *R5*	.....	.....	.....	.....	.....	15.35
So. Chicago *R5*	.....	.....	.....	10.10	.....	.....
Ensley *T2*	5.75	6.725	.....	.....	.....	.....
Fairfield *T2*	.....	6.725	.....	10.10	6.875	.....
Gary *U1*	5.75	.....	.....	.....	6.875	.....
Huntington, *C16*	.....	6.725	.....	.....	.....	.....
Ind. Harbor *I3*	.....	.....	.....	10.10	.....	.....
Johnstown *B5*	.....	6.725	.....	.....	.....	.....
Joliet *U1*	.....	.....	7.25	.....	.....	.....
Kansas City *S2*	.....	.....	.....	10.10	.....	15.35
Lackawanna *B5*	5.75	6.725	7.25	.....	6.875	.....
Lebanon *B5*	.....	.....	7.25	.....	.....	15.35
Minnequa *C6*	5.75	7.225	7.25	10.10	6.875	15.35
Pittsburgh *S14*	.....	.....	.....	.....	.....	15.35
Pittsburgh *J3*	.....	.....	.....	10.10	.....	.....
Seattle *B2*	.....	.....	.....	.....	6.75	15.85
Steelton *B5*	5.75	.....	7.25	.....	6.875	.....
Struthers *Y1*	.....	.....	.....	10.10	.....	.....
Torrance *C7*	.....	.....	.....	.....	6.75	.....
Williamsport *S5*	.....	6.725	.....	.....	.....	.....
Youngstown *R3*	.....	.....	.....	10.10	.....	.....

COKE

	Net-Ton
Furnace, beehive (f.o.b.) Connellsville, Pa.	$14.75 to $15.50
Foundry, beehive (f.o.b.)	$18.50
Foundry oven coke	
Buffalo, del'd	$33.25
Ironton, O., f.o.b.	30.50
Detroit f.o.b.	32.00
New England, del'd	33.55
New Haven, f.o.b.	31.00
Kearney, N. J., f.o.b.	31.25
Philadelphia, f.o.b.	31.00
Swedeland, Pa., f.o.b.	31.00
Painesville, Ohio, f.o.b.	32.00
Erie, Pa., f.o.b.	32.00
St. Paul, f.o.b.	31.25
St. Louis, f.o.b.	33.00
Birmingham, f.o.b.	30.35
Milwaukee, f.o.b.	32.00
Neville Is., Pa.	30.75

LAKE SUPERIOR ORES

51.50% Fe natural, delivered lower Lake ports. Interim prices for 1959 season. Freight changes for seller's account.

	Gross Ton
Openhearth lump	$12.70
Old range, bessemer	11.85
Old range, nonbessemer	11.70
Mesabi, bessemer	11.60
Mesabi, nonbessemer	11.45
High phosphorus	11.45

ELECTRICAL SHEETS

22-Gage F.o.b. Mill Cents Per Lb	Hot-Rolled (Cut Lengths)*	Cold-Reduced (Coiled or Cut Length) Semi-Processed	Cold-Reduced (Coiled or Cut Length) Fully Processed
Field	.....	9.875	.....
Armature	11.70	11.20	11.70
Elect.	12.40	11.90	12.40
Special Motor	.....	12.475	.....
Motor	13.55	13.05	13.55
Dynamo	14.65	14.15	14.65
Trans. 72	15.70	15.20	15.70
Trans. 65	16.30		
		Grain Oriented	
Trans. 58	16.80	Trans. 80	19.70
Trans. 52	17.85	Trans. 73	20.20
		Trans. 66	20.70

Producing points: Aliquippa (*J3*); Beech Bottom (*W5*); Brackenridge (*A3*); Granite City (*G2*); Indiana Harbor (*I3*); Mansfield (*E2*); Newport, Ky. (*A9*); Niles, O. (*S1*); Vandergrift (*U1*); Warren, O. (*R3*); Zanesville, Butler (*A7*).

ELECTRODES

Cents per lb. f.o.b. plant, threaded, with nipples, unboxed.

GRAPHITE Diam. (In.)	GRAPHITE Length (In.)	GRAPHITE Price	CARBON* Diam. (In.)	CARBON* Length (In.)	CARBON* Price
24	84	27.25	40	100, 110	12.50
20	72	26.50	35	110	11.20
18	72	27.50	30	110	11.70
14	72	27.25	24	72	11.95
12	72	28.25	20	90	11.55
10	60	29.50	17	72	12.10
10	48	30.00	14	72	12.55
7	60	29.75	10	60	13.80
6	60	33.25	8	60	14.25
4	40	37.00			
3	40	39.25			
2½	30	41.50			
2	24	64.00			

* Prices shown cover carbon nipples.

REFRACTORIES

Fire Clay Brick

Carloads per 1000

Super duty, Mo., Pa., Md., Ky.	$185.00
High duty (except Salina, Pa., add $5.00)	140.00
Medium duty	125.00
Low duty (except Salina, Pa., add $2.00)	103.00
Ground fire clay, net ton, bulk	22.50

Silica Brick

Mt. Union, Pa., Ensley, Ala.	$158.00
Childs, Hays, Latrobe, Pa.	163.00
Chicago District	168.00
Western Utah	183.00
California	165.00
Super Duty Hays, Pa., Athens, Tex., Windham, Warren, O., Morrisville	163.00-168.00
Silica cement, net ton, bulk, Latrobe	29.75
Silica cement, net ton, bulk, Chicago	26.75
Silica cement, net ton, bulk, Ensley, Ala.	27.75
Silica cement, net ton, bulk, Mt. Union	25.75
Silica cement, net ton, bulk, Utah and Calif.	39.00

Chrome Brick

Per net ton

Standard chemically bonded, Balt.	$109.00
Standard chemically bonded, Curtiner, Calif.	119.00
Burned, Balt.	103.00

Magnesite Brick

Standard, Baltimore	$140.00
Chemically bonded, Baltimore	119.00

Grain Magnesite

St. ⅜ to ½-in. grains

Domestic, f.o.b. Baltimore in bulk.	$73.00
Domestic, f.o.b. Chewalah, Wash., Luning, Nev. in bulk	46.00
in sacks	52.00-54.00

Dead Burned Dolomite

Per net ton

F.o.b. bulk, producing points in:	
Pa., W. Va., Ohio	$16.75
Missouri Valley	15.60
Midwest	17.00

(Effective April 11, 1960)

MERCHANT WIRE PRODUCTS

F.o.b. Mill	Standard & Coated Nails Col	Woven Wire Fence Col	"T" Fence Posts Col	Single Loop Bale Ties Col	Galv. Barbed and Twisted Barbless Wire Col	Merch. Wire Ann'ld ¢/lb.	Merch. Wire Galv. ¢/lb.
Alabama City *R5*	173	187	...	212	193	9.00	9.55
Aliquippa *J3***	173	190	...	...	190	9.00	9.675
Atlanta *A8***	175	193	...	214	199	9.10	9.85
Bartonville *K2***	175	193	183	214	199	9.10	9.85
Buffalo *W6*	.....	.....	.....	.....	.....	9.00	9.55*
Chicago *N4***	173	191	177	212	197	9.00	9.75
Chicago *R3*	.....	.....	.....	.....	.....	9.00	9.55
Cleveland *A6*	.....	.....	.....	.....	.....	.....	.....
Cleveland *A5*	.....	.....	.....	.....	.....	9.00	.....
Crawf'dav. *M4***	175	193	...	214	199	9.10	9.85
Donora, Pa. *A5*	173	187	...	212	193	9.00	9.55
Duluth *A5*	173	187	177	212	193	9.00	9.55
Fairfield, Ala. *T2*	173	187	...	212	193	9.00	9.55
Galveston *D4*	9.10‡	.....	.....	.....	.....	.....	.....
Houston *S2*	178	192	...	217	198	9.25	9.80†
Jacksonville *M4*	184-1	197	...	219	203	9.10	9.775
Johnstown *B3***.*	173	190	177	...	196	9.00	9.675
Joliet, Ill. *A5*	173	187	...	212	193	9.00	9.55
Kokomo *C9**	175	189	...	214	195*	9.10	9.65*
L. Angeles *B2***.*	.....	.....	.....	.....	.....	9.95	10.625
Kansas City *S2**.	178	192	...	217	198*	9.25	9.80†
Minnequa *C6*	178	192	182	217	198†	9.25	9.80†
Palmer, Mass. *W6*	.....	.....	.....	.....	.....	9.30	9.85*
Pittsburg, Cal. *C7*	192	210	...	...	213	9.95	10.50
Rankin, Pa. *A5*	173	187	...	...	193	9.00	9.55
So. Chicago *R5*	173	187	...	...	193	8.65	9.20
S. San Fran. *C6*	.....	.....	.....	236	.....	9.95	10.50†
SparrowsPt. *B3***.*	175	.....	.....	214	198	9.10	9.775
Struthers, O. *Y1**	.....	.....	.....	.....	.....	8.65	9.20
Worcester *A5*	179	.....	.....	.....	.....	9.30	9.85
Williamsport *S5*	.....	.....	.....	.....	.....	.....	.....

* Zinc less than .10¢. *** .10¢ zinc.
** 13-13.5¢ zinc. † Plus zinc extras.
‡ Wholesalers only.

C-R SPRING STEEL

Cents Per Lb F.o.b. Mill	CARBON CONTENT 0.26-0.40	0.41-0.60	0.61-0.80	0.81-1.05	1.06-1.35
Anderson, Ind. *G4*	8.95	10.40	12.60	15.60	18.55
Baltimore, Md. *T8*	9.50	10.70	12.90	15.90	18.85
Bristol, Conn. *W12*	.....	10.70	12.90	16.10	19.30
Boston *T8*	9.50	10.70	12.90	15.90	18.85
Buffalo, N. Y. *R7*	8.95	10.40	12.60	15.60	18.55
Carnegie, Pa. *S9*	8.95	10.40	12.60	15.60	18.55
Chicago	.....	.....	.....	15.60	.....
Cleveland *A5*	8.95	10.40	12.60	15.60	18.55
Dearborn *S1*	9.05	10.50	12.70	.....	.....
Detroit *D1*	9.05	10.50	12.70	15.70	.....
Detroit *D2*	9.05	10.50	12.70	.....	.....
Dover, O. *G4*	8.95	10.40	12.60	15.60	18.55
Evanston, Ill. *M8*	9.05	10.40	12.60	.....	.....
Franklin Park, Ill. *T8*	9.05	10.40	12.60	15.60	18.55
Harrison, N. J. *C11*	.....	.....	12.90	16.10	19.30
Indianapolis *R5*	9.10	10.55	12.60	15.60	18.55
Los Angeles *C1*	11.15	12.60	14.80	17.80	.....
New Britain, Conn. *S7.*	9.40	10.70	12.90	15.90	18.85
New Castle, Pa. *B4*	8.95	10.40	12.60	15.60	.....
New Haven, Conn. *D1*	9.40	10.70	12.90	15.90	.....
Pawtucket, R. I. *N7*	9.50	10.70	12.90	15.90	18.85
Riverdale, Ill. *A1*	9.05	10.40	12.60	15.60	18.55
Sharon, Pa. *S1*	8.95	10.40	12.60	15.60	18.55
Trenton, *R4*	.....	10.70	12.90	16.10	19.30
Wallingford *W1*	9.40	10.70	12.90	15.90	18.55
Warren, Ohio *T4*	8.95	10.40	12.60	15.60	18.75
Worcester, Mass. *A5*	9.50	10.70	12.90	15.90	18.85
Youngstown *R5*	9.10	10.55	12.60	15.60	18.55

BOILER TUBES

$ per 100 ft. carload lots cut 10 to 24 ft. F.o.b. Mill	Size OD-In.	Size B.W. Ga.	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
Babcock & Wilcox	2	13	40.28	47.21	35.74
	2½	12	54.23	63.57	48.13
	3	12	62.62	73.40	55.59
	3½	11	73.11	85.70	65.84
	4	10	97.08	113.80	88.10
National Tube	2	13	40.28	47.21	35.74
	2½	12	54.23	63.57	48.13
	3	12	62.62	73.40	55.59
	3½	11	73.11	85.70	65.84
	4	10	97.08	113.80	88.10
Pittsburgh Steel	2	13	40.28	47.21	.....
	2½	12	54.23	63.57	.....
	3	12	62.62	73.40	.....
	3½	11	73.11	85.70	.....
	4	10	97.08	113.80	.....

METAL POWDERS

(Cents per lb, f.o.b. shipping point for ton lots, except as noted)

Iron Powders

Sponge Iron, domestic and foreign, 98 pct Fe, 100 mesh bags	11.50
Electrolytic Iron, melting stock, 99.87 pct Fe	28.75
Carbonyl Iron	88.00
Welding Grades	8.10
Cutting and Scarfing Grades	9.85

Copper Powders

Molding Grades	
Electrolytic, domestic, f.o.b. shipping point	14.25†
Atomized	47.50 to 65.50
Reduced	14.25†
Bronze, 5000-lb lots	54.00 to 57.60
Chromium, electrolytic	5.00
Lead	7.50†
Manganese, electrolytic	$1.00
Molybdenum	$3.60 to $3.95
Nickel	$1.15
Nickel-Silver, 5000 lb lots	60.90 to 69.70
Solder	7.00†
Stainless Steel, 302	$1.07
Stainless Steel, 316	$1.07
Tin	14.00†
Titanium, 99.25 + pct, per lb, f.o.b.	$11.25
Tungsten	$3.15 (nominal)

† Plus cost of metal.

FASTENERS

(Base discounts, f.o.b. mill, based on latest list prices)

Hex Screws and All Bolts Including Hex & Hex, Square Machine, Carriage, Lag, Plow, Step, and Elevator

(Discount for 1 container)

Plain finish—packaged and bulk	50 pct
Hot galvanized and zinc plated —packaged	43.75 pct
Hot galvanized and zinc plated —bulk	50 pct

Nuts: Hexagon and Square, Hex, Heavy Hex, Thick Hex & Square

(Discount for 1 container)

Plain finish — packaged and bulk	50 pct
Hot galvanized and zinc plated—packaged	43.75 pct
Hot galvanized and zinc plated—bulk	50 pct

Hexagon Head Cap Screws—UNC or UNF Thread—Bright & High Carbon

(Discount for 1 container)

Plain finish — packaged and bulk	50 pct
Hot galvanized and zinc plated—packaged	43.75 pct
Hot galvanized and zinc plated—bulk	50 pct

(On all the above categories add 25 pct for less than container quantities. Minimum plating charge—$10.00 per item. Add 7½ pct for nuts assembled to bolts)

Machine Screws and Stove Bolts

(Packages—plain finish)

	Discount Screws	Bolts
Full Cartons	46	46

Machine Screws—bulk

¼ in. diam or smaller	25,000 pcs	50
5/16, ⅜ & ½ in. diam	15,000 pcs	50

Machine Screw and Stove Bolt Nuts

(Packages—plain finish)

	Discount Hex	Square
Full Cartons	46	57
Bulk		
¼ in. diam or smaller	25,000 pcs	
5/16 or ⅜ in. diam	56	60
	15,000 pcs	
	56	60

Rivets

	Base per 100 lb
½ in. diam and larger	$12.85
	Pct Off List
7/16 in. and smaller	15

ELECTROPLATING SUPPLIES

Anodes

(Cents per lb, frt allowed in quantity)

Copper	
Rolled elliptical, 18 in. or longer, 5000 lb lots	48.00
Electrodeposited	40.00
Brass, 80-20, ball anodes, 2000 lb or more	53.00
Zinc, ball anodes, 2000 lb lots	19.75
(for elliptical add 1¢ per lb)	
Nickel, 99 pct plus, rolled carton, 5000 lb	1.0225
(Rolled depolarized add 3¢ per lb)	
Cadmium, 5000 lb	1.30
Tin, ball anodes $1.05 per lb (approx.).	

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 100 lb drum	65.90
Copper sulphate, 100 lb bags, per cwt.	27.75
Nickel salts, single, 100 lb bags	36.00
Nickel chloride, freight allowed, 100 lb	45.00
Sodium cyanide, domestic, f.o.b. N. Y., 200 lb drums (Philadelphia price 25.00)	23.70
Zinc cyanide, 100 lb	60.75
Potassium cyanide, 100 lb drum N. Y.	45.50
Chromic acid, flake type, 10,000 lb or more	30.44

CAST IRON WATER PIPE INDEX

Birmingham	125.8
New York	138.5
Chicago	139.8
San Francisco-L. A.	148.6

Dec. 1955, value, Class B or heavier 5 in. or larger, bell and spigot pipe. Explanation: p. 57, Sept. 1, 1955, issue Source: U. S. Pipe and Foundry Co.

STEEL SERVICE CENTERS

Metropolitan Price, dollars per 100 lb.

Cities	City Delivery‡ Charge	Sheets: Hot-Rolled (18 ga. & hvr.)	Sheets: Cold-Rolled (15 gage)	Sheets: Galvanized (18 gage)††	Strip: Hot-Rolled	Plates	Shapes: Standard Structural	Bars: Hot-Rolled (merchant)	Bars: Cold-Finished	Alloy Bars: Hot-Rolled 4615 As rolled	Alloy Bars: Hot-Rolled 4140 Annealed	Alloy Bars: Cold-Drawn 4615 As rolled	Alloy Bars: Cold-Drawn 4140 Annealed
Atlanta		8.59	9.87	10.13	8.91	9.29	9.40	9.39	13.24				
Baltimore**	.10	8.63	10.10	10.16	11.04	9.25	10.02	9.43	11.90	17.48	16.48	21.58	20.83
Birmingham**		9.43	10.20	10.46	10.41	9.29	9.50	9.09	13.14	16.76			
Boston**	.10	9.77	10.68	11.87	12.26	9.72	10.26	9.87	13.45	17.69	16.69	21.79	21.04
Buffalo**	.15	8.95	10.10	11.30	10.80	9.15	9.80	9.15	11.60	17.45	16.45	21.55	20.80
Chicago**	.15	8.89	10.35	11.10	10.55	8.82	9.48	8.99	10.80	17.10	16.10	19.70	20.45
Cincinnati**	.15	9.06	10.41	11.10	10.87	9.20	10.04	9.31	11.68	17.42	16.42	21.52	20.77
Cleveland**	.15	8.88[1]	10.03	11.29	10.66	9.07	9.90	9.11	11.40	17.21	16.21	21.31	20.56
Denver	.20	9.60	11.84	12.94	9.63	9.96	10.04	10.00	11.19				20.84
Detroit**	.15	9.15	10.61	11.45	10.92	9.19	10.04	9.30	11.16	17.38	16.38	21.48	20.73
Houston**		9.22	10.03	12.193	10.78	8.95	8.86	8.63	13.10	17.50	16.55	21.55	20.85
Kansas City**	.15	9.36	11.02	11.50	11.02	9.25	9.95	9.46	11.72	17.17	15.87	21.87	21.12
Los Angeles**		9.95[1]	11.55	12.20	11.55	10.00	10.00	9.75	14.20	18.30	17.35	22.90	22.20
Memphis	.15	8.55	9.80		8.60	8.93	9.01	8.97	12.11				
Milwaukee**	.15	9.03	10.49	11.24	10.69	8.96	9.70	9.13	11.04	17.24	16.24	21.24	20.49
New York	.10	9.46	10.23	11.45	11.56	9.61	10.30	9.84	13.35	16.16	16.50	20.10	20.85
Norfolk	.20	8.20			8.90	8.65	9.20	8.90	10.70				
Philadelphia	.10	9.20	10.10	10.99	11.20	9.65	9.95	9.60	12.05	16.58	16.48	20.08	20.03
Pittsburgh**	.15	8.88	10.03	11.18	10.64	8.83	9.51	9.00	11.40	17.10	16.10	19.70	20.45
Portland		10.00	11.75	13.30	11.95	11.50	11.10	9.85	15.30	18.50	17.45	20.75	20.25
San Francisco**	.10	11.00	11.95[2]	11.65	12.25	11.00	10.95	10.75	15.20	18.30	17.35	22.90	22.20
Seattle**		11.55	12.30	12.50	12.65	11.00	10.20	11.10	16.20	18.60	17.80	22.70	22.20
Spokane**	.15	11.70	12.45	12.65	13.30	11.15	11.35	11.75	16.35	17.75	17.95	21.58	22.35
St. Louis**	.15	8.69	10.73	11.48	10.65	8.93	9.60	9.10	11.43	17.48	16.48	21.58	20.83
St. Paul**	.15	9.19	9.74	10.89	10.81	9.10	9.78	9.27	11.64		16.69		21.04

Base Quantities (Standard unless otherwise keyed): Cold finished bars: 2000 lb or over. Alloy bars: 1000 to 1999 lb. All others: 2000 to 4999 lb. All HR products may be combined for quantity. All galvanized sheets may be combined for quantity. CR sheets may be combined with each other for quantity. ** These cities are on net pricing. Prices shown are for 2000 lb item quantities of the following: Hot-rolled sheet—10 ga. x 36 x 96—120; Cold-rolled sheet—20 ga x 36 x 96—120; Galv. sheet—10 ga x 36—120; Hot-rolled strip—⅛" x 1"; Plate—¼" x 84"; Shapes—I-Beams 6 x 12.5; Hot-rolled bar—Rounds—¾-2 15/16; Cold-finished bar—C 1018—1" rounds; Alloy bar—hot-rolled 4615—1⅝" to 2⅞"; cold drawn—15/16" to 2⅞" round; Hot-rolled 4140—⅝" to 2¾" round, cold drawn—15/16" to 2⅞" round.

†† 13¢ zinc. ‡ Deduct for country delivery. [1] 15 ga. & heavier; [2] 14 ga. & lighter. [3] 10 ga. x 48 — 120.

(Effective April 11, 1960)

PIG IRON

Dollars per gross ton, f.o.b., subject to switching charges.

Producing Point	Basic	Fdry.	Mall.	Bess.	Low Phos.
Birdsboro, Pa. *B6*	68.00	68.50	69.00	69.50	73.00
Birmingham *R3*	62.00	62.50*	.....	.....	.....
Birmingham *W9*	62.00	62.50*	66.50	.....	.....
Birmingham *U4*	62.00	62.50*	66.50	.....	.....
Buffalo *R3*	66.00	66.50	67.00	67.50	.....
Buffalo *H1*	66.00	66.50	67.00	67.50	71.50†
Buffalo *W6*	66.00	66.50	67.00	67.50	.....
Chester *P2*	68.00	68.50	69.00	.....	.....
Chicago *I4*	66.00	66.50	66.50	67.00	.....
Cleveland *A5*	66.00	66.50	66.50	67.00	71.00†
Cleveland *R3*	66.00	66.50	66.50	67.00	.....
Duluth *I4*	66.00	66.50	66.50	67.00	71.00†
Erie *I4*	66.00	66.50	66.50	67.00	71.00†
Everett *M6*	67.50	68.00	68.50	.....	.....
Fontana *K1*	75.00	75.50	.....	.....	.....
Geneva, Utah *C7*	66.00	66.50	.....	.....	.....
Granite City *G2*	67.90	68.40	68.90	.....	.....
Hubbard *Y1*	.....	.....	66.50	.....	.....
Ironton, Utah *C7*	66.00	66.50	.....	.....	.....
Midland *C11*	66.00	.....	.....	.....	.....
Minnequa *C6*	68.00	68.50	69.00	.....	.....
Monessen *P6*	66.00	.....	.....	.....	.....
Neville Is. *P4*	66.00	66.50	66.50	67.00	71.00†
N. Tonawanda *T1*	.....	66.50	67.00	67.50	.....
Sharpsville *S3*	66.00	.....	66.50	67.00	.....
So. Chicago *R3*	66.00	66.50	66.50	67.00	.....
So. Chicago *W8*	66.00	.....	66.50	67.00	.....
Swedeland *A2*	68.00	68.50	69.00	69.50	73.00†
Toledo *I4*	66.00	66.50	66.50	67.00	.....
Troy, N. Y. *R3*	68.00	68.50	69.00	69.50	73.00
Youngstown *Y1*	.....	.....	66.50	.....	.....

DIFFERENTIALS: Add, 75¢ per ton for each 0.25 pct silicon or portion thereof over base (1.75 to 2.25 pct except low phos., 1.75 to 2.00 pct) 50¢ per ton for each 0.25 pct manganese or portion thereof over 1 pct, $2 per ton for 0.50 to 0.75 pct nickel, $1 for each additional 0.25 pct nickel. Add $1.00 for 0.31-0.69 pct phos.

Silvery Iron: Buffalo (6 pct), *H1*, $79.25; Jackson *J1*, *I4*, (Globe Div.), $78.00; Niagara Falls (15.01-15.50), $101.00; Keokuk (14.01-14.50), $89.00; (15.51-16.00), $92.00. Add 75¢ per ton for each 0.50 pct silicon over base (6.01 to 6.50 pct) up to 13 pct. Add $1.00 for each 0.50 pct manganese over 1.00 pct.

† Intermediate low phos.

STAINLESS STEEL

Base price cents per lb. f.o.b. mill

Product	201	202	301	302	303	304	316	321	347	403	410	416	430
Ingots, reroll.	22.75	24.75	24.00	26.25	—	28.00	41.25	33.50	38.50	—	17.50	—	17.75
Slabs, billets	28.00	31.50	29.00	32.75	33.25	34.50	51.25	41.50	48.25	—	22.25	—	22.50
Billets, forging	—	37.75	38.75	39.50	42.50	42.00	64.50	48.75	57.75	29.25	29.25	29.75	29.75
Bars, struct.	43.50	44.50	46.00	46.75	49.75	49.50	75.75	57.50	67.25	35.00	35.00	35.50	35.50
Plates	39.25	40.00	41.25	42.25	45.00	45.75	71.75	54.75	64.75	30.00	30.00	31.25	31.00
Sheets	48.50	49.25	51.25	52.00	56.75	55.00	80.75	65.50	79.25	40.25	40.25	31.75 48.25	40.75
Strip, hot-rolled	36.00	39.00	37.25	40.50	—	43.75	68.50	53.50	63.50	—	31.00	—	32.00
Strip, cold-rolled	45.00	49.25	47.50	52.00	56.75	55.00	80.75	65.50	79.25	40.25	40.25	42.50	40.75
Wire CF; Rod HR	—	42.25	43.50	44.25	47.25	47.00	71.75	54.50	63.75	33.25	33.25	33.75	33.75

STAINLESS STEEL PRODUCING POINTS:

Sheets: Midland, Pa., *C11;* Brackenridge, Pa., *A3;* Butler, Pa., *A7;* Vandergrift, Pa., *U1;* Washington, Pa., *W2, J2;* Baltimore, *E1;* Middletown, O., *A7;* Massillon, O., *R3;* Gary, *U1;* Bridgeville, Pa., *U2;* New Castle, Ind., *I2;* Detroit, *M2;* Louisville, O., *R5.*

Strip: Midland, Pa., *C11;* Waukegan, Cleveland, *A5;* Carnegie, Pa., *S9;* McKeesport, Pa., *F1;* Reading, Pa., *C2;* Washington, Pa., *W2;* W. Leechburg, Pa., *A3;* Bridgeville Pa., *U2;* Detroit, *M2;* Detroit, *S1;* Canton, Massillon, O., *R3;* Harrison, N. J., *D3;* Youngstown, *R5;* Sharon, Pa., *S1;* Butler, Pa., *A7,* Wallingford, Conn., *U3* (plus further conversion extras); *W1* (25¢ per lb. higher); Seymour, Conn., *S13,* (25¢ per lb. higher); New Bedford, Mass., *R6* Gary, *U1,* (25¢ per lb. higher); Baltimore, Md., *E1* (300 series only).

Bar: Baltimore, *A7;* S. Duquesne, Pa., *U1;* Munhall, Pa., *U1;* Reading, Pa., *C2;* Titusville, Pa., *U2;* Washington, Pa., *J2;* McKeesport, Pa., *U1, F1;* Bridgeville, Pa., *U2;* Dunkirk, N. Y., *A3;* Massillon, O., *R5;* S. Chicago, *U1;* Syracuse, N. Y., *C11;* Watervliet, N. Y., *A3;* Waukegan, *A5;* Canton, O., *T5, R3;* Ft. Wayne, *I4;* Detroit, *R5;* Gary, *U1;* Owensboro, Ky., *G5;* Bridgeport, Conn., *N8;* Ambridge, Pa., *B7.*

Wire: Waukegan, *A5;* Massillon, O., *R3;* McKeesport, Pa., *F1;* Ft. Wayne, *J4;* Newark, N. J. *D2;* Harrison, N. J., *D3;* Baltimore, *A7;* Dunkirk, *A3;* Monessen, *P1;* Syracuse, *C11;* Bridgeville, *U2;* Detroit, *R5;* Reading, Pa., *C2;* Bridgeport, Conn., *N8* (down to and including ¼").

Structurals: Baltimore, *A7;* Massillon, O., *R3;* Chicago, Ill., *J4;* Watervliet, N. Y., *A3;* Syracuse, *C11;* S. Chicago, *U1.*

Plates: Ambridge, Pa., *B7;* Baltimore, *E1;* Brackenridge, Pa., *A3;* Chicago, *U1;* Munhall, Pa., *U1;* Midland, Pa., *C11;* New Castle, Ind., *I2;* Middletown, *A7;* Washington, Pa., *J2;* Cleveland, Massillon, *R3;* Coatesville, Pa., *C15;* Vandergrift, Pa., *U1;* Gary, *U1.*

Forging billets: Ambridge, Pa., *B7;* Midland, Pa., *C11;* Baltimore, *A7;* Washington, Pa., *J2;* McKeesport, *F1;* Massillon, Canton, O., *R3;* Watervliet, *A3;* Pittsburgh, Chicago, *U1;* Syracuse, *C11;* Detroit, *R5;* Munhall, Pa., S. Chicago, *U1;* Owensboro, Ky., *G5;* Bridgeport, Conn., *N8;* Reading, Pa , *C2.*

(Effective April 11, 1960)

Rear-pump body for automatic transmission cast from gray iron using shell-molds and -cores.

modern shell-mold casting for:

IMPROVED ACCURACY

Size and location of the oil ports in the pump body illustrated are maintained within *a tolerance of 0.015 inch* by using shell-cores.

SMOOTHER FINISHES

Faithful reproduction obtained with shell-molds, and the absence of burnt-in sand reduce the amount of machining and finishing required.

GREATER RELIABILITY

Carefully controlled analysis plus precise heat-treating in our own modern facilities insure uniformly high quality and dependability.

OVERNIGHT DELIVERY WITHIN 500 MILES | to fill your IMMEDIATE NEEDS for QUALITY PRECISION CASTINGS at LOWER COST

GL GREAT LAKES FOUNDERS & MACHINE CORP.
LUDINGTON, MICH.

Specialists in Stack, CO_2, and Shell-Mold Casting

DYKEM STEEL BLUE

Stops Losses making Dies and Templates

Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead

THE DYKEM COMPANY
2303G North 11th St. • St. Louis 6, Mo.

CUT SCRAPER TIME
END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2303G NORTH 11TH ST., ST. LOUIS 6, MO.

GOSS and DE LEEUW
MULTIPLE SPINDLE
CHUCKING MACHINES
Tool Rotating
GOSS & DE LEEUW MACHINE CO., KENSINGTON, CONN.

Ferrochrome

Cents per lb contained Cr, lump, bulk, carloads, del'd. 67-71% Cr, .30-1.00% max. Si.

0.02% C....	41.00	0.50% C....	38.00
0.05% C....	39.00	1.00% C....	37.75
0.10% C....	38.50	1.50% C....	37.50
0.20% C....	38.25	2.00% C....	37.25

4.00-4.50% C, 60-70% Cr, 1-2% Si.. 37.25
3.50-5.00% C, 57-64% Cr, 2.00-4.50% Si 28.25
0.025% C (Simplex) 36.75
5-7% C, 61-65% Cr, 5-8% Si 22.00
5% max C, 50-55% Cr, 2% max Si.. 25.00

High Nitrogen Ferrochrome

Low-carbon type 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome max. 0.10% C price schedule.

Chromium Metal

Per lb chromium, contained, packed, delivered, ton lots, 97.25% min. Cr, 1% max. Fe.
0.10% max. C $1.29
9 to 11% C, 88-91% Cr, 0.75% Fe... 1.38

Electrolytic Chromium Metal

Per lb of metal 2" x D plate (⅛" thick) delivered packed, 99.80% min. Cr. (Metallic Base) Fe 0.20 max.
Carloads $1.15
Ton lots 1.17
Less ton lots 1.19

Low Carbon Ferrochrome Silicon

(Cr 39-41%, Si 42-45%, C 0.05% max.)
Carloads, delivered, lump, 3-in. x down, packed.
Price is sum of contained Cr and contained Si.

	Cr	Si
Carloads, bulk	28.25	14.60
Ton lots	33.50	16.05
Less ton lots	35.10	17.70

Calcium-Silicon

Per lb of alloy, lump, delivered, packed. 30-33% Cr, 60-65% Si, 3.00 max. Fe.
Carloads, bulk 24.00
Ton lots 27.95
Less ton lots 29.45

Calcium-Manganese—Silicon

Cents per lb of alloy, lump, delivered, packed.
16-20% Ca, 14-18% Mn, 53-59% Si.
Carloads, bulk 23.00
Ton lots 26.15
Less ton lots 27.15

SMZ

Cents per pound of alloy, delivered, 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe ½ in. x 12 mesh.
Ton lots 21.15
Less ton lots 22.40

V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, V-5; 38-42% Cr, 17-19% Si, 8-11% Mn, packed.
Carload lots 18.45
Ton lots 19.95
Less ton lots 21.20

Graphidox No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis, Si 48 to 52%, Ti 9 to 11%, Ca 5 to 7%.
Carload bulk 19.20
Ton lots to carload packed 21.15
Less ton lots 22.40

Ferromanganese

Maximum base price, f.o.b., lump size, base content 74 to 76 pct Mn. Carload lots, bulk.

Producing Point	Cents per-lb
Marietta, Ashtabula, O.; Alloy, W. Va.; Sheffield, Ala.; Portland, Ore.	11.00
Johnstown, Pa.	11.00
Lynchburg, Va.	11.00
Neville Island, Pa.	11.00
Sheridan, Pa.	11.00
Philo, Ohio	11.00
S. Duquesne	11.00

Add or substract 0.1¢ for each 1 pct Mn above or below base content.
Briquets, delivered, 66 pct Mn:
Carloads, bulk 13.70
Ton lots packed in bags 16.10

Spiegeleisen

Per gross ton, lump, f.o.b., 3% Si max.

Mn	Palmerton, Pa. 10 lb, pig	35 lb, down	Neville Is., Pa. 35 lb
16-19% ..	$98.00	$96.00	$100.50
19-21% ..	100.00	98.00	102.50
21-23% ..	102.50	100.50	105.50

Manganese Metal

2 in. x down, cents per pound of metal delivered.
95.50% min. Mn, 0.2% max. C, 1% max. Si, 2.5% max. Fe.
Carload, packed 45.75
Ton lots 47.25

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, f.o.b. Marietta, O., delivered, cents per pound.
Carloads, bulk 34.25
Ton lots, palletized 36.25
250 to 1999 lb 39.00
Premium for Hydrogen - removed metal 0.75

Medium Carbon Ferromanganese

Mn 80 to 85%, C 1.25 to 1.50, Si 1.50% max., carloads, lump, bulk, delivered, per lb of contained Mn 24.00

Low-Carb Ferromanganese

Cents per pound Mn contained, lump size, packed, del'd Mn 85-90%.

	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	(Bulk) 37.15	39.95	41.15
0.07% max. C	35.10	37.90	39.10
0.10% max. C	34.35	37.15	38.35
0.15% max. C.	31.10	33.90	35.10
0.30% max. C	29.80	32.60	33.80
0.50% max. C	28.50	31.30	32.50
0.75% max. C, 80.85% Mn, 5.0-7.0% Si ...	27.00	29.80	31.00

Silicomanganese

Lump size, cents per pound of metal, 65-68% Mn, 18-20% Si, 1.5% max. C for 2% max. C, deduct 0.3¢ f.o.b. shipping point.
Carloads bulk 11.60
Ton lots, packed 13.25
Carloads, bulk, delivered, per lb of briquet 14.00
Briquets, packed pallets, 2000 lb up to carloads 16.40

Silvery Iron (electric furnace)

Si 15.50 to 16.00 pct., f.o.b. Keokuk, Iowa, or Wenatchee, Wash., $106.50 gross ton, freight allowed to normal trade area. Si 15.01 to 15.50 pct, f.o.b. Niagara Falls, N. Y., $93.00.

Silicon Metal

Cents per pound contained Si, lump size, delivered, packed.

	Ton lots,	Carloads,
98.25% Si, 0.50% Fe..	22.95	21.65
98% Si, 1.0% Fe	21.95	20.65

Silicon Briquets

Cents per pound of briquets, bulk, delivered, 40% Si, 2 lb Si, briquets.
Carloads, bulk 8.00
Ton lots, packed 10.80

Electric Ferrosilicon

Cents per lb contained Si, lump, bulk, carloads, f.o.b. shipping point.

50% Si....	14.60	75% Si....	16.90
65% Si....	15.75	85% Si....	18.60
	90% Si....	20.00	

Ferrovanadium

50-55% V delivered, per pound, contained V, in any quantity.
Openhearth 3.20
Crucible 3.30
High speed steel 3.40

Calcium Metal

Eastern zone, cents per pound of metal, delivered.

	Cast	Turnings	Distilled
Ton lots	$2.05	$2.95	$3.75
100 to 1999 lb..	2.40	3.30	4.55

(Effective April 11, 1960)

Alsifer, 20% Al, 40% Si, 40% Fe, f.o.b. Suspension Bridge, N. Y., per lb.

Carloads, bulk ..... 9.85¢
Ton lots ..... 11.20¢

Calcium molybdate, 43.6-46.6% f.o.b. Langeloth, Pa., per pound contained Mo $1.50

Ferrocolumbium, 58-62% Cb, 2 in. x D, delivered per pound
Ton lots $3.45
Less ton lots..... 3.50

Ferro-tantalum-columbium, 20% Ta, 40% Cb, 0.30% C, del'd ton lots, 2-in. x D per lb con't Cb plus Ta $3.40

Ferromolybdenum, 55-75%, 200-lb containers, f.o.b. Langeloth, Pa., per pound contained Mo.. $1.76

Ferrophosphorus, electric, 23-26%, car lots, f.o.b. Siglo, Mt. Pleasant, Tenn., $5.00 unitage, per gross ton $120.00
10 tons to less carload $131.00

Ferrotitanium, 40% regular grade 0.10% C max., f.o.b. Niagara Falls, N. Y., and Cambridge, O., freight allowed, ton lots, per lb contained Ti $1.35

Ferrotitanium, 25% low carbon, 0.10% C max., f.o.b. Niagara Falls, N. Y., and Cambridge, O., freight allowed, ton lots, per lb contained Ti $1.50
Less ton lots $1.54

Ferrotitanium, 15 to 18% high carbon, f.o.b. Niagara Falls, N. Y., freight allowed, carload per net ton $255.00

Ferrotungsten, ¼ x down packed, per pounds contained W, ton lots delivered ..... $2.15 (nominal)

Molybdic oxide, briquets per lb contained Mo, f.o.b. Langeloth, Pa. $1.49
bags, f.o.b. Washington, Pa., Langeloth, Pa. $1.38

Simanal, 20% Si, 20% Mn, 20% Al, f.o.b. Philo, Ohio, freight allowed, per lb.
Carload, bulk lump ..... 18.50¢
Ton lots, packed lump ..... 20.50¢
Less ton lots ..... 21.00¢

Vanadium oxide, 86-89% V_2O_5 per pound contained V_2O_5 .... $1.38

Zirconium silicon, per lb of alloy 35-40% del'd, carloads, bulk.. 26.25¢
12-15%, del'd lump, bulk-carloads ..... 9.25¢

Boron Agents

Borosil, per lb of alloy del. f.o.b. Philo, Ohio, freight allowed, B 3-4%, Si 40-45%, per lb contained B
2000 lb carload $5.50

Ferro Zirconium Boron, Zr 50% to 60%, B 0.8% to 1.0%, Si 8% max., C 8% max., Fe balance, fo.b. Niagara Falls, New York, freight allowed, in any quantity per pound ..... 30¢

Corbortam, Ti 15-21%, B 1-2%, Si 2-4%, Al 1-2%, C 4-5-7.5%, f.o.b., Suspension Bridge, N. Y., freight allowed.
Ton lots per pound ..... 18.25¢

Ferroboron, 17.50 min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in. x D, ton lots... $1.20
F.o.b. Wash., Pa., Niagara Falls, N. Y., delivered 100 lb up
10 to 14% B ..... .85
14 to 19% 1.20
19% min. B 1.50

Grainal, f.o.b. Cambridge, O., freight, allowed, 100 lb and over
No. 1 ..... $1.05
No. 79 ..... 50¢

Manganese-Boron, 75.00% Mn, 17.50% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. x D, del'd.
Ton lots (packed) $1.46
Less ton lots (packed) 1.57

Nickel-Boron, 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni, del'd less ton lots 2.15

REBUILT—GUARANTEED ELECTRICAL EQUIPMENT

MOTOR GENERATOR SETS

TYPICAL FOR MILL & REEL DRIVES

(2) 3500-K.W. Al. Chal. 5-unit Sets of (2) 1750-KW Gen., 350/700-VDC, (1) 5000-H.P. Syn. Motor, 13800/6900/4160-V., 3 ph., 60 cy. (1) 40-KW & (1) 10-KW Exciters.
(1) 600-K.W. Gen. Elec. 3-unit Set of (2) 300-KW, 250-VDC Gen. & (1) 750-HP Syn. Motor 4160/2300-V., 3 ph., 60 cy. & Magnetic F.V. Starting Cubicles.
(1) 200-K.W. Gen. Elec. 3 unit Set of (2) 100-KW Gen., 250-VDC, B.B. & 300-HP Syn. Motor 2300-V., 3 ph., 60 cy. Mag. F.V. Starting equipment.

STANDARD GENERAL PURPOSE SETS

QU.	KW	MAKE	D.C. VOLTS	A.C. VOLTS
1	2400	G.E.	250	4600/2300
1	1500	G.E.	250	4600/2300
1	1250	G.E.	132/265	4160
2	500	Whse.	280	4000/2300
1	400	G.E.	275	4000/2300
1	300	G.E.	250	4000/2300
4	250	Whse.	250	2300
2	200	G.E.	260/275	4000/2300
2	150	G.E.	250	440
1	125	G.E.	250	440
1	100	G.E.	250	440

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For listing of Motors, Generators, Transformers, M.G. Sets, Mill Motors, etc.
See last week issue.

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W. Coast Sales Hit Snappy Pace

Used machine dealers on the West Coast report business is strong and expect it to stay that way.

■ Industry's growth on the West Coast keeps used machinery dealers there happy and hopping.

Population pressure means a constantly widening range of regionally-made products and services. Dealers' sales come more and more from makers of consumer items. But defense-based industries are still the most important market.

Snappy Pace—All major West Coast areas report a snappy sales pace. Supplies of used machines are plentiful except in Seattle. There's very little searching for equipment in eastern markets.

Southern California dealers picked up quite a bit of machinery in a rash of auctions. Metalworking shops and the Air Force put a lot of machines on the market. Dealers had no trouble finding buyers. To move inventory along, dealers were willing to cut prices and make up the profit on volume business.

Sheet metal equipment still ranks in the number one seller spot. Press brakes and shears—late models in good condition—go fast. Right now the electronics industry wants big sheet metal machines. The need reflects fuller production in these plants and a stronger shift to consumer products.

Also in demand: Boring mills and big lathes. But they must be in tip-top shape.

Different Attitude—In northern California, dealers look for a good year. At the start of 1960, some had their doubts. Business sentiment is now much improved.

Lathes and milling machines are the items most active. Demand is strongest for top quality merchandise.

Only one dealer checked by The IRON AGE said he was doing some limited buying in the East. And that's only on special orders for equipment not available in the San Francisco Bay area.

Financing is no problem. In fact, several reported the money situation considerably eased.

Inquiries Fair—Dealers say they are getting a fairly active number of inquiries. While it takes hard selling to translate these into orders, it can be done often enough to encourage the man willing to put out the work.

Prices are holding fairly firm. One dealer reports prices may be down about 10 pct from 1959. But he points out the equipment also is a year older, so there's nothing to be concerned about.

Foreign tools also are enjoying the upswing. One dealer, who has a good volume of such business, said he's importing stuff from all countries. Standard items are moving best.

Up in Seattle—Prices in Seattle are moving up. The used machinery market picked up faster than dealers had forecast. Result: Short supplies and longer delivery time in some lines, and slightly higher prices.

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Gear Shaper, No. 7A Mod. 7125A Fellows, HS, Univ.
Gear Tester, No. 13 Gleason Univ.
Gear Shaver, Model GCC 8" Red Ring
Grinder, Centerless, No. 2 Cincinnati Filmatic brg., late
Grinder, Cylindrical, 12" x 48" Cincinnati Univ. Filmatic, late
Grinder, Cylindrical, 22" x 72" Landis Univ.
Grinders, Disc, 24" Mod. 22I Hanchett opposed wheel, dbl. disc.
Grinders, Internal, No. 72A3 Heald Gagematic
Grinders, Internal, No. 72A3 Heald Sizematic
Grinders, Internal, No. 72A5 Heald pl. univ.
Grinders, Internal, No. 24-36 Bryant hole
Grinders, Surface, 12" x 12" x 48" Thompson type C, horiz.
Grinders, Surface, 20" No. 25A Heald hyd. rotary
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Mills, Automatic No. 33 Sundstrand "Fluidscrew" Rigidmil
Mills, Boring, 5" bar Sellers horiz. table type
Mills, Boring, 60" Gisholt vert.
Mills, Planer Type, 42" x 42" x 18' Ingersoll, adj. rail
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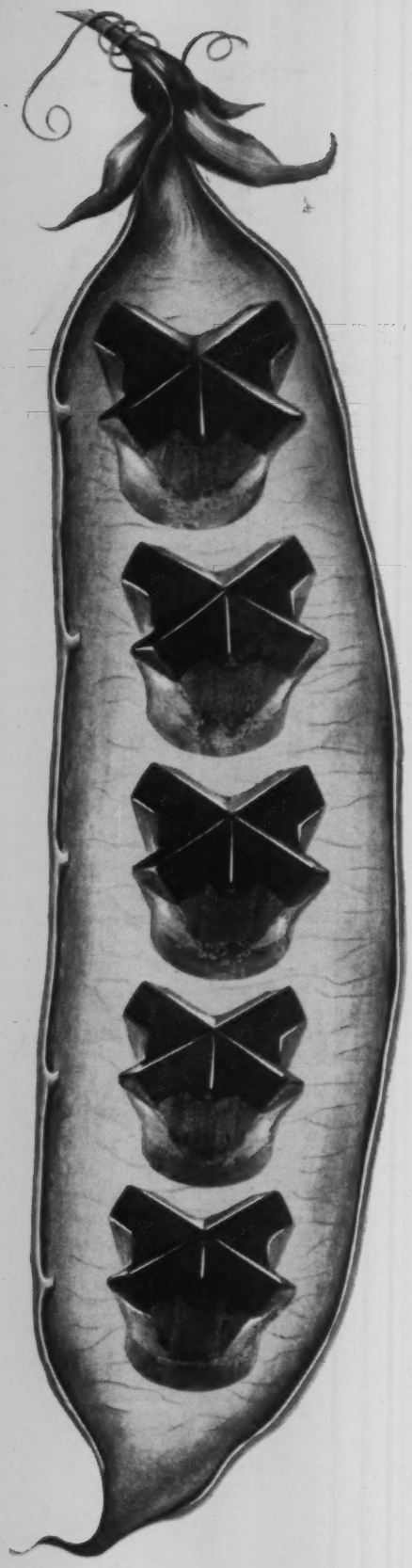

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